

PUBLIC WORKS

Mar.
1955

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C. L. Bayler is Village Engineer of Downers Grove, Ill. A member of many professional and engineering associations, he is responsible for engineering control of streets, water works and parking. More on page 20.

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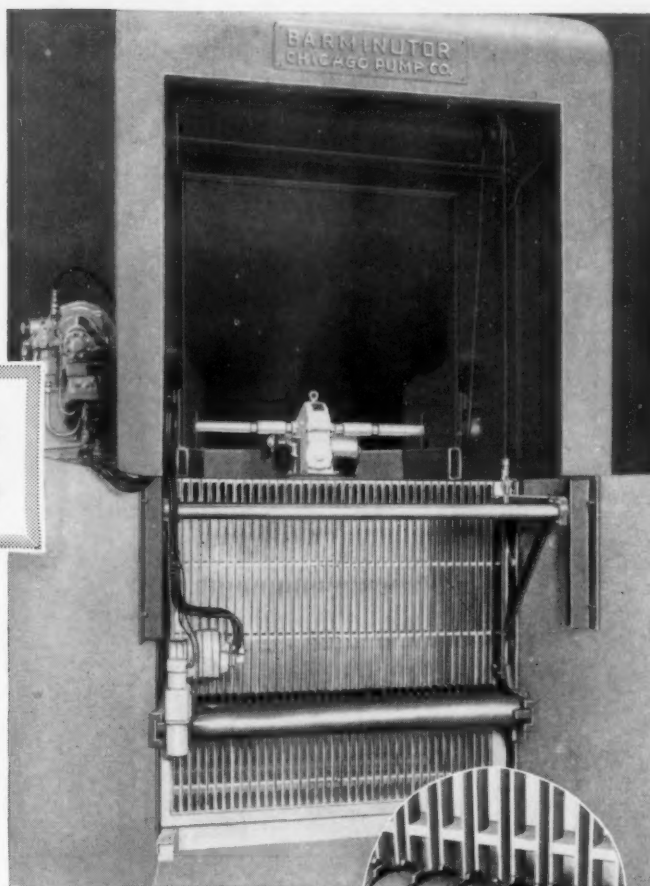
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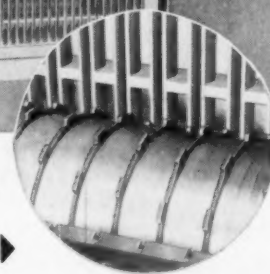
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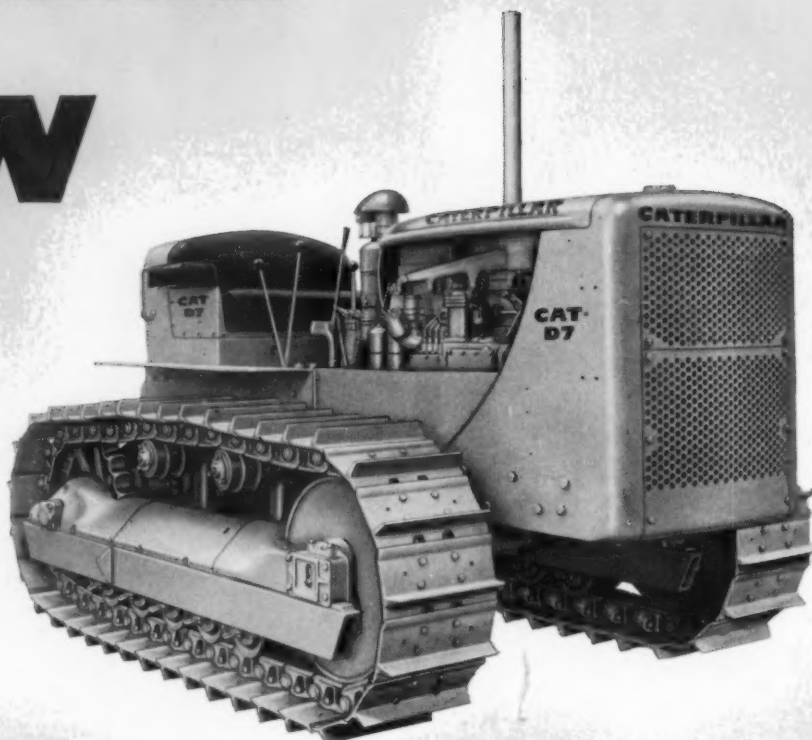


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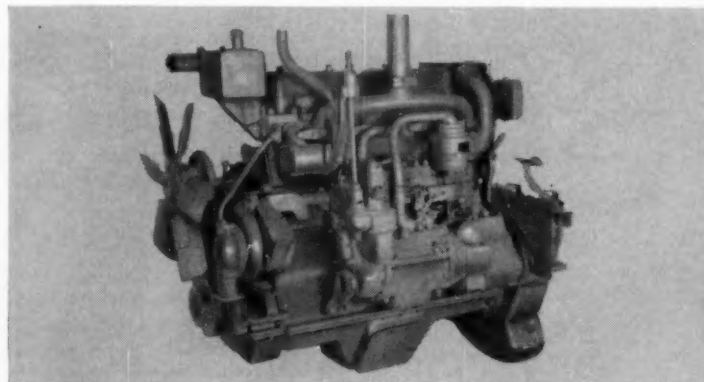
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Published Monthly by Public Works Journal
Corporation. Office of Publication at Orange,
Conn. Editorial and Advertising offices at 310
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scription rates: U.S.A. and possessions, \$3.00.
Canada and South America, \$4.00. All other
countries, \$7.00. Single copies 50¢ each, except
special issues which are \$1. Acceptance under
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PUBLIC WORKS MAGAZINE

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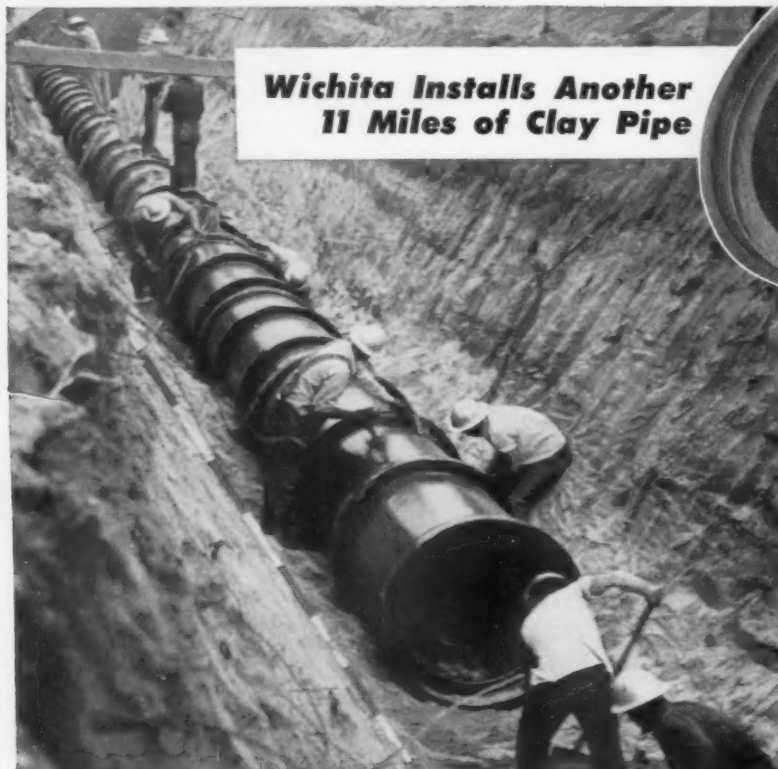
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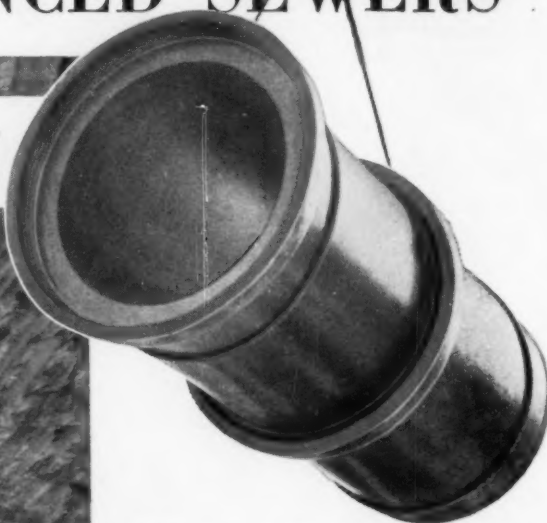
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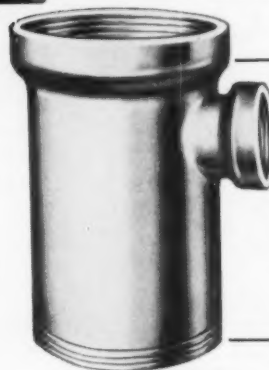


**Wichita Installs Another
11 Miles of Clay Pipe**



More than 59,000 feet of Clay Pipe, 18 to 36 inches, are being installed in Wichita, Kan., under the direction of Eugene N. Smith, City Manager; George J. Fisher, Director of Service; and B. E. Smith, City Engineer. Contractor is Utility Contractors, Inc., under Paul W. Brock, President. Project Engineer: Ray E. Lawrence. Resident Engineer: Don Proudfit. Consulting Engineers: Black and Veatch.

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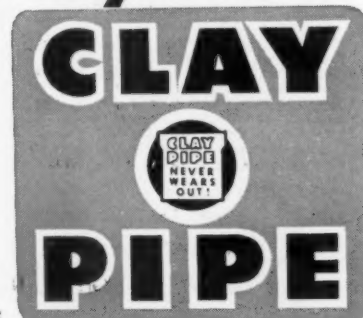
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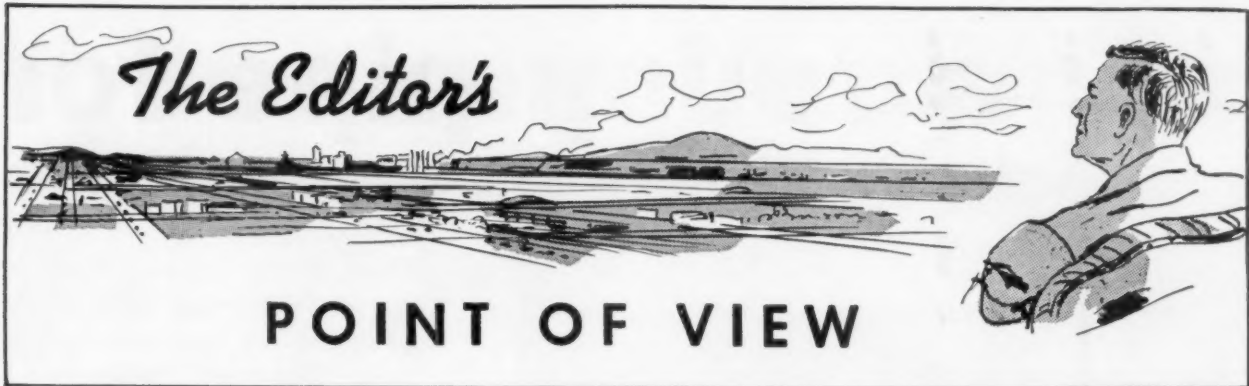
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Engineering Training and Background Essential in Planning for Refuse Disposal

THERE are some places where sanitary landfill offers the best solution for a community's refuse disposal problem; and there are other places where incineration is best. In most cities, the relative advantages of the two can be determined fully only by a careful engineering survey and study. A well-qualified city engineer is entirely capable of doing this work; but where such a man is not available, consulting engineers should be called in. Many factors must be considered, such as areas available for either method of disposal; length of haul and the resulting cost; objections of property owners; and overall costs based on the service life of the installation. All of these are fundamentally engineering in nature.

Refuse disposal, which is closely allied to the health and comfort of the community's population, is one of the neglected factors in modern life. Probably not half of our communities have progressed beyond the open dumps similar to those used by cities back at the dawn of civilization. It is past time that these were eliminated; and in eliminating them we ought to employ the best skills available to insure that whatever is installed represents the finest investment possible for the community.

It Is About Time We Put Our Power Lines Underground

INCREASING reliance on electric power for modern living makes it essential that an early start be made on putting power lines underground where they will not be affected by wind, ice and other adverse weather conditions. Most home heating furnaces will not run unless electricity is available; refrigeration is wholly dependent on such power, and cooking is also in many places. Lighting is the least essential of these services.

After every severe storm hundreds of thousands of families are left without power, often for days, while power company personnel struggle to repair the power lines. At the same time, it is rare to have the water supply disrupted for any appreciable length of time. Since electric power is just about as essential as is water, the same stand-

ards should apply to both. Putting wires underground would cost money, yet most people would gladly pay the small added cost to be assured of uninterrupted service during critical times. We think that every community should seriously and immediately consider a program of this sort; and it is something that Civil Defense also might properly be interested in.

NSF Has Substantially Furthered Good Sanitation

IN ITS ten years of existence, the National Sanitation Foundation has accomplished much. It has provided a unique industry-health department liaison which may well be a model to other fields of public service. The need for it arose from the fact that there was little agreement or uniformity as to what constituted sanitation safety in many of the types of equipment then being produced. Standards varied from state to state and even from city to city; and there was so little background of solid scientific information available to health officials that they found difficulty in judging the merits of this new equipment. Thanks to a courageous NSF and its forward-looking measures, many of these obstructions have been cleared away. Much yet remains to be done, but great progress has been made in a very difficult field.

Here Comes a Street Flusher—Don't Get Wet!

HAVE our urban citizens become so accustomed to strident honking and city noise that they no longer react to these warnings?

This thought came to mind when we noticed the driver of a New York City street flusher sounding his horn with a very gentle but persistent "beep-beep" to warn passersby of his approach. It worked; curious pedestrians turned and moved out of spray range when they heard this unfamiliar, well-modulated toot.

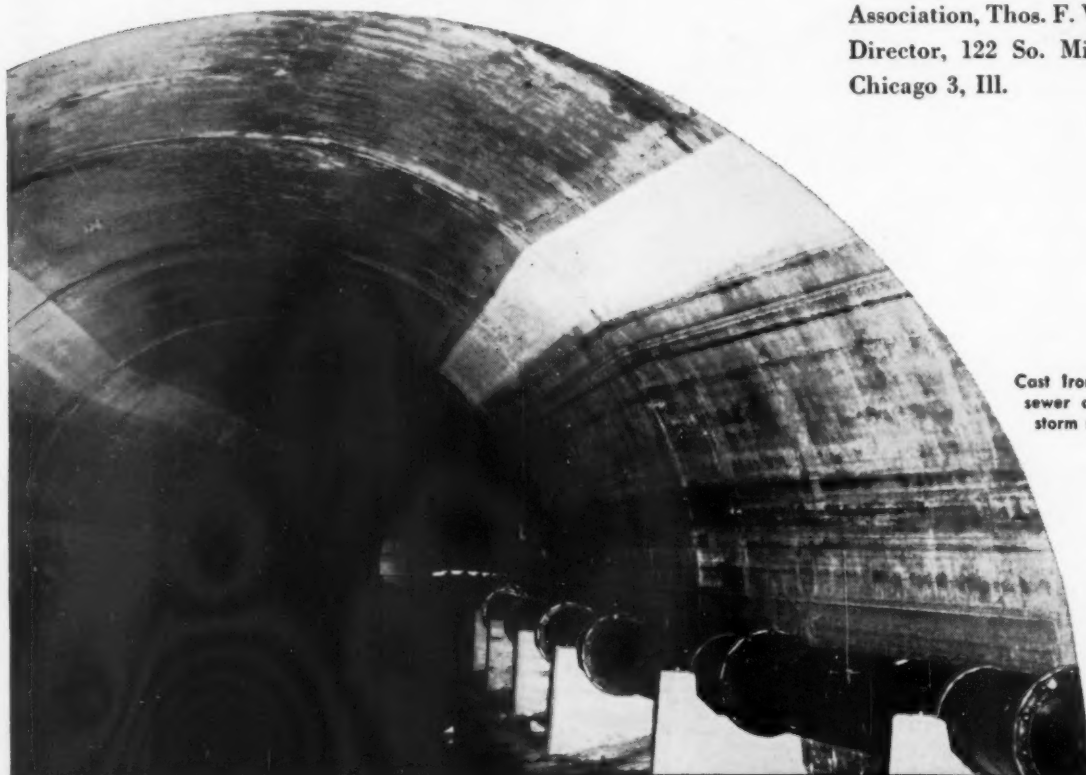
Unfortunately, to sound this warning the driver had to keep one hand busy tapping the horn button. Perhaps some cities have equipped their flushers with special audible warning devices which have a signal easily distinguished from the usual raucous noise of traffic. We would like to hear about them; it could be a good idea.

a TOUGH pipe for



Industrial waste and other piping for large manufacturer in suburban Chicago, Ill.

Cast iron pipe has been famed for centuries as a rugged material with proved ability to withstand beam, compressive and shock stresses. Today's *modernized* cast iron pipe—centrifugally cast—is even tougher, even stronger and more uniform in quality. Its effective resistance to corrosion, plus high strength factors, ensure long life, underground or underwater. When an engineer needs a tough pipe for tough requirements, his first and last thought are usually: *specify cast iron pipe*. For information write Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 122 So. Michigan Avenue, Chicago 3, Ill.



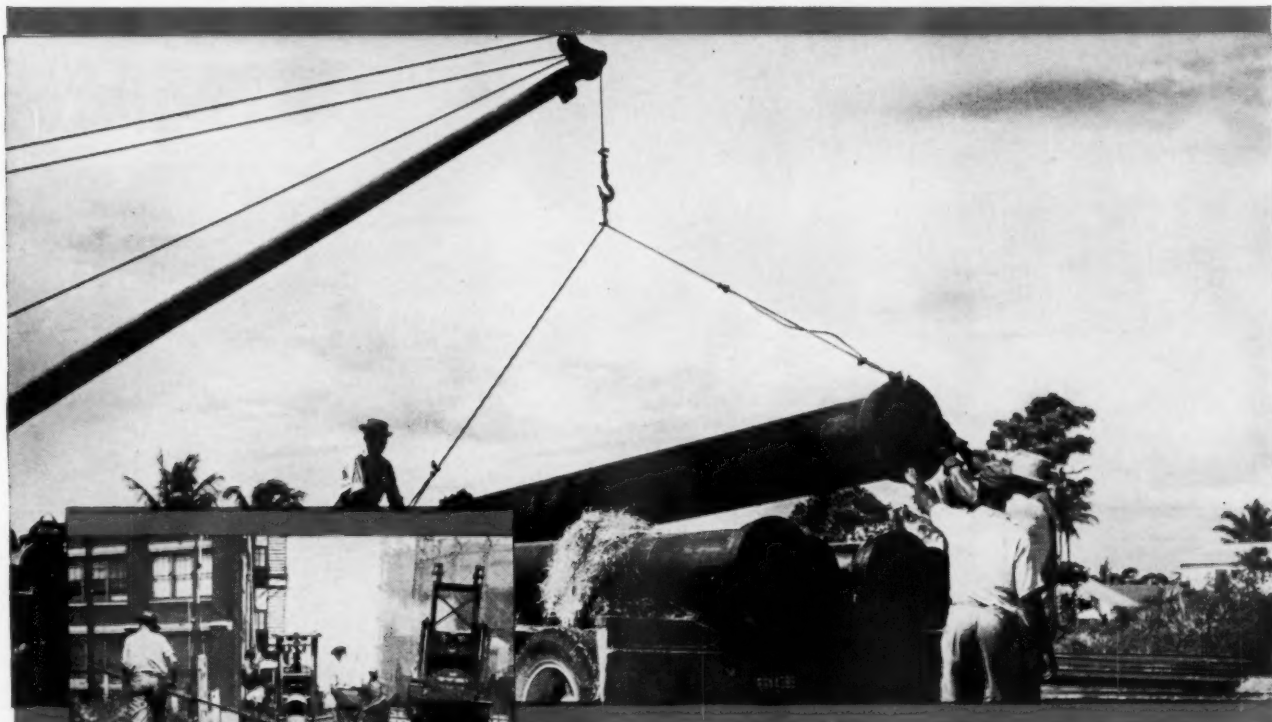
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Cast Iron Pipe relief sanitary sewer constructed in existing storm sewer: Tulsa, Okla.

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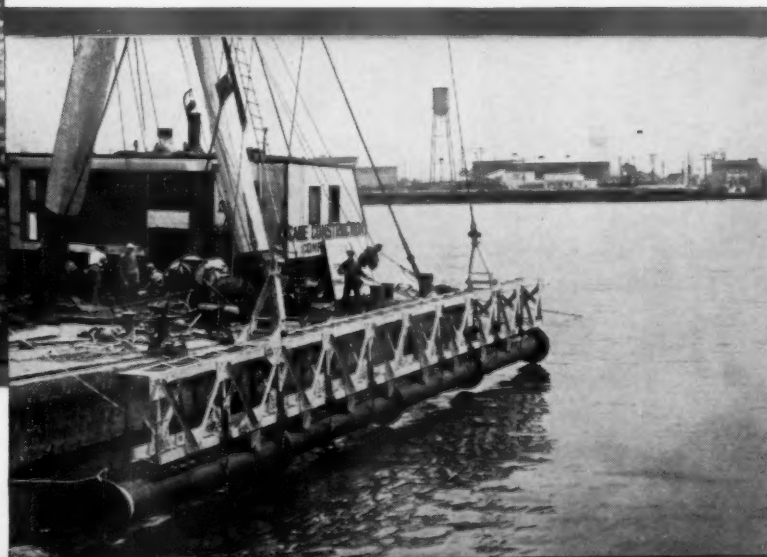


Unloading 16" Cast Iron Pipe for water supply system at Ft. Lauderdale, Fla.



Installing Cast Iron gas main in Chicago's North Side.

Cast Iron ball-and-socket joint water supply line being installed in channel bottom between Terminal Island and outer Los Angeles harbor.



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Now's the time to mail this month's Reader's Service card.



Good Roads INTRODUCES THE "ODELL" SPREADER

Three years ago Robert Odell, a general contractor, designed a new hopper-type asphalt and aggregate spreader for his own use, since no spreader on the market satisfied him. It worked so well that other contractors asked him to build similar machines for them. A total of five were made, and all of them have been operating successfully for the past two years.

Good Roads bought the basic design from Odell, and now manufactures and offers the "Odell" spreader as a standard item in its complete line of road construction and maintenance equipment. Except for minor changes to adapt it to factory production and strengthen certain components, it is the same unit that has been successfully field-tested by Odell and others.

Get full details of this month's products . . . mail your Readers' Service card today.

AGGREGATE AND ASPHALT SPREADER

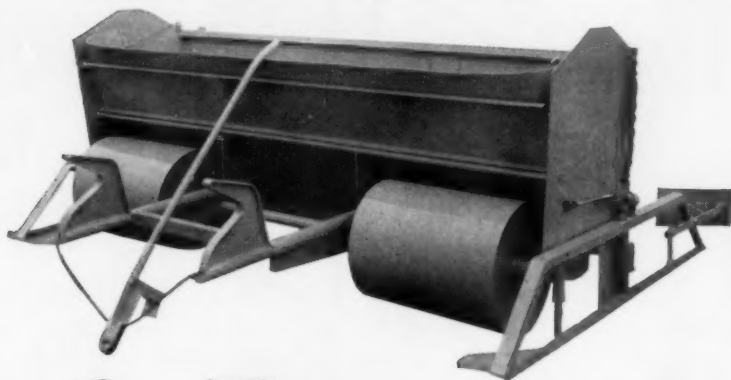
VERSATILITY, ACCURACY AND SPEED

Outstanding in the "Odell" Spreader is its extreme simplicity of design—permitting a single low-priced machine to perform a wide variety of spreading operations easily and quickly.

It hooks to any standard dump or semi-dump truck in just a few seconds without the use of truck-mounted attachments and is transported between jobs on the truck tailgate. When spreading, the hopper rides on wide steel rollers which travel over sub-grade or base without digging or gouging. Smooth, accurate spread

is assured by a "strike-off" unit that floats free of the hopper, on 6-ft. long steel runners.

Hot or cold-mix asphalt, bank-run gravel, coarse or fine slag and limestone, cinders and practically any kind of base materials can be spread to any thickness from feather-edge to 8 inches. Over-all width is 8 ft. 6 in. for laying an 8 ft. spread. Unit may be blocked off for any width under 8 feet, and can be extended to 10 feet in a matter of seconds.



Sturdy all-steel welded construction design provides durability with light weight. Low initial cost and exceptionally fast operation means big savings on all kinds of paving jobs from pathways or small driveways to large highways, parking lots, airport taxi strips or runways.

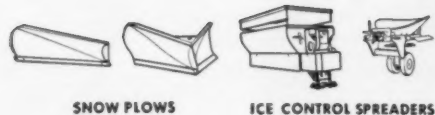
Good Roads "HANDY" AGGREGATE SPREADER

For accurate, smooth laying of sand, gravel, cinders, stone, etc. Good Roads offers the reliable "Handy" aggregate spreader. Flexible keyboard gate of tempered spring-steel fingers permits oversize particles in material to drop through without marring the spread pattern. Spread is controlled up to three inch depth by micrometer adjustment.

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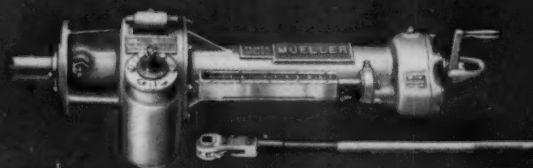


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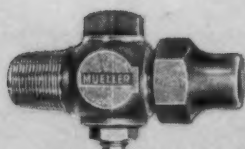


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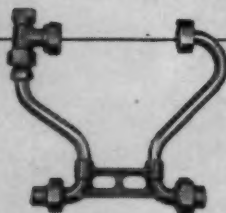
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For use on all types of pipe . . . single or double strap . . . full depth tapped hole . . . Neoprene or lead ring gasket . . . all sizes and threads available.



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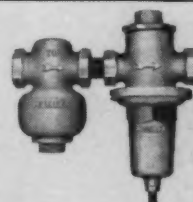
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Exclusive "four-point contact" disc wedging mechanism . . . fully bronze-mounted . . . conventional or "O" ring stem packing . . . rising or non-rising stem . . . AWWA.

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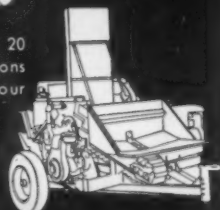
Dependable Since 1857

MAIN OFFICE & FACTORY DECATUR, ILLINOIS

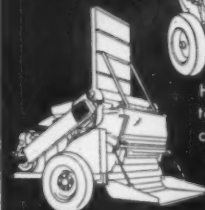
McConnaughay ASPHALT MIXERS



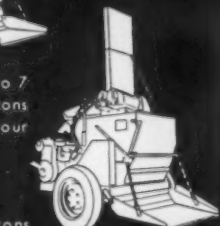
HTD-JR... up to 20
tons hot mix, 60 tons
cold mix per hour



HTD-LP... up to 10
tons hot mix, 30 tons
cold mix per hour



HTD-500... up to 7
tons hot mix, 15 tons
cold mix per hour



JR... up to 60 tons
cold mix per hour



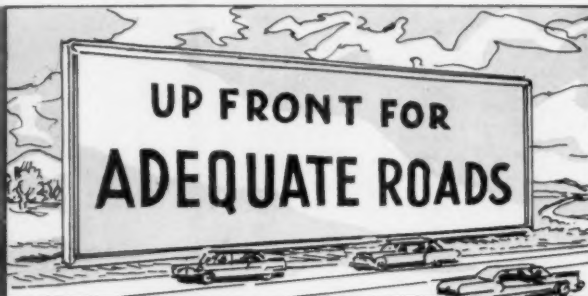
HTD-B... up to 5
tons hot mix, 10 tons
cold mix per hour



... for resurfacing and patching in any season

DESIGNED for economy of operation and fast production, the McConnaughay line of Multi-Pug Asphalt Mixers meets every need for most resurfacing as well as all types of pavement patching. Working on location, these mixers provide the exact amounts of materials needed (never too much or too little); and McConnaughay HTD models are the only mixers which effectively remove both moisture and solvents from bituminous mixtures... positive assurance that patches and resurfaced areas will set up hard. Write, wire or 'phone for details and specifications.

K. E. McConnaughay
LAFAYETTE, INDIANA



by LEO J. RITTER, JR.

New Asphalt Specifications—Many highway organizations have, for many years, been dissatisfied with their specifications for asphalts used in high-type paving mixtures. It isn't that asphalts obtained under existing specifications are not satisfactory in the majority of cases, it's that many materials people feel they could be better, particularly from the standpoint of durability. After extensive study, California has developed new specifications which are now being evaluated in a series of test sections on a portion of U. S. 101 between Santa Barbara and Santa Maria. Some of the sections contain asphalts bought under the new specifications, some those bought under the old. Several years may be necessary before the new asphalts can be evaluated properly.

Principal changes in the new specifications include the following:

- (1) Increase in flash point.
- (2) More rigid requirements relative to penetration, including the penetration ratio—which is the ratio of penetration at 39.2°F. under 200 gram load for one minute to standard penetration (AASHTO method T49).
- (3) Reduction in permissible loss on heating (5 hours at 325°F.)
- (4) Elimination of requirements relative to ductility and solubility in carbon disulfide.

Convention Chatter — Got to spend a couple of days at the Highway Research Board meeting in January, thanks to the kind sponsorship of Public Works. As usual, this was a real fine, working meeting—with a multitude of papers and a large number of different sessions. Over 1000 attended the meeting, about the usual number. The meeting has grown so large that it is impossible to attend many of the sessions, since they must be carried on at the same time in different buildings. Parts of the program which we heard were interesting and worthwhile — a couple of the papers are discussed briefly elsewhere in this column

and others will appear in the pages of Public Works during the year. We always enjoy the opportunity to renew old acquaintanceships and make new ones—our greetings to all those we saw and some we missed. What's new? Many, many things in every area of interest—much of the material is about details; other about broad concepts—much of it trickles down to practical application later, in the form of improved materials, better construction methods, improved planning, etc. Attended the meeting of the Committee on Compaction of Subgrades, Bases, etc., which has been sparked for several years by Jack Hicks of North Carolina.

While in Washington, we visited briefly at the Civil Aeronautics Administration, seeking information about the federal-aid airport program. As you probably know, the current program is the largest in several years—about \$20 million. All projects under the current program are already programmed, but there probably will be a greater amount of money available next year.

We didn't make the ARBA meeting in New Orleans, but every one we have talked to says it was one of the finest ARBA has ever had. Incidentally, next year the HRB and ARBA meetings will *not* conflict. Next year's ARBA meeting will be in Miami—year after that, in Chicago, with a Road Show.

Attended a little of the AED meeting in Chicago late in January, our first time at this one. Man, the manufacturers and distributors really work (during the day, at least) at this one. Attention was focused upon problems of the equipment industry. Had an interesting visit with an old friend, A. O. Williamson of Bros Boiler & Mfg. Co.

Big Town — The Department of Traffic of the City of New York has asked the Board of Estimate to approve the construction of six municipal off-street parking facilities at a cost of \$5 million. First plan



Build Functional and Distinctive Sewage Treatment Plants with Architectural Concrete

This sewage treatment plant in Centralia, Wash. exemplifies how architectural concrete combines functional qualities with distinctive appearance.

Centralia has a combined sanitary and storm sewer system. During the rainy season the sewage is given primary treatment only.

As a primary plant its capacity is $4\frac{1}{2}$ m.g.d. and as a complete treatment plant 2 m.g.d.

Designers and engineers: Carey & Kramer, Seattle. Builder: A. G. Homann Co., Olympia.

Architectural concrete is an ideal construction material for sewage treatment plants. Its clean, neat appearance is a symbol of cleanliness and

good municipal housekeeping. It makes the building a long-lasting asset and a source of community pride. It also offers:

1 UNUSUAL DURABILITY. It resists such destructive agents as severe weathering, fire, decay and sewage gases.

2 GREAT STRENGTH. It can be designed economically to withstand all vertical and horizontal forces.

3 REAL ECONOMY. Moderate first cost, low maintenance cost, long life = **low annual cost.**

Investigate the advantages of architectural concrete for sewage treatment plants. Write for free literature, distributed only in U. S. and Canada.

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IN THE NORFOLK, VA. area all of the members of the Septic Tank Manufacturers Association of Tidewater use Cleveland trenchers—and *only* Clevelands—for the excavation of septic tank and leach beds, and sanitary lines. Members of the association have completed 12,000 septic tank jobs since 1950.

The compactness and easy maneuverability of Clevelands are outstanding advantages in this type of work. Normal daily schedule for each contractor is 3 complete septic tank jobs averaging 300 feet of trench 18 to 24 inches wide, 2 to 3 feet deep, dug to 100% accurate grade. Soil conditions in the Tidewater region vary from sandy loam

to tight clay, all easy digging for the rugged Clevelands.

Their fast safe portability permits these Clevelands to be moved easily from job to job and their wide range of digging speeds—to fit every job and weather condition—means that each job gets done *on time, every time.*

Maneuverability, compactness, speed, versatility, portability—these are just a few of the important reasons why these Tidewater contractors have standardized on Clevelands for all their trenching jobs. You can be sure that Clevelands will perform just as profitably for *you*, because they're...

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submitted to the Board is for a half-million dollar, all-day commuter parking lot near the Woodhaven station of the IND subway. Others include a garage on Manhattan's upper East side, two garages in the upper Bronx, a lot in Brooklyn, and another near the Jamaica station of the Long Island railroad. The six facilities are to be a part of a proposed five-year program which plans the establishment of 60 parking lots and garages on the City's periphery. Our source of information—the interesting, mimeographed Bulletin published monthly by the Department.

Research Topics — Among papers given at the HRB meeting were two that intrigued us. One of them was a report of the stabilization of Tennessee gravel and chert bases by E. A. Whitehurst of the University of Tennessee. The paper discusses laboratory investigations of various soil stabilizing agents, including Portland cement, emulsified and cutback asphalts, road tar, lime, lime-flyash, and calcium acrylate. Of the materials used, Portland cement seemed to be the most effective, by far, used in the amount of 4 per cent by weight. Another paper by Ernest Zube of the California Division of Highways tells of experimental uses in that state of asphalt-latex emulsion for the construction of thin wearing surfaces on steel deck bridges. This material, in combination with suitable crushed aggregates, appears to be entirely satisfactory in providing a non-skid, durable, and lightweight surface on steel bridges.

Origin—Destination Data Analysis —An excellent article on the analysis of data from origin-destination surveys appears in the January issue of the *Traffic Quarterly*, published by the Eno Foundation, Saugatuck, Conn. Written by Arthur T. Row, the paper presents a logical sequence of steps employed in the analysis of data collected in the Detroit Metropolitan Area Traffic Study. Techniques used to implement the steps in the analysis are minimized in the paper.

Making Little Ones Into Big Ones —The trend toward merging of the smaller manufacturing companies in the highway equipment field with the large ones continues. One of the most recent is the purchase of the J. D. Adams Co. by Le Tourneau-Westinghouse, which in turn is a wholly owned subsidiary



HOW THE MAIN FRAME CONTRIBUTES TO TOP TRACTOR PERFORMANCE

One of the big reasons why more and more Allis-Chalmers tractors are being used today is their exclusive main frame design.

These frames are one-piece, all-steel welded structural members (like the girders in a bridge or the columns in a building). They help provide greater strength and flexibility to withstand shock loads . . . make possible better equipment mounting, improved weight distribution and outstanding service simplicity.

We invite you to see these advantages . . . first at your nearby Allis-Chalmers dealer and then in a demonstration.

"Rolls with the Punch" — All-steel main frame flexes slightly under extreme shock loads . . . without transmitting the strain to engine, clutch or transmission.

Better Equipment Mounting — This frame's compactness provides ample clearance for equipment like front-end shovels . . . permits wide track shoes . . . improves performance of entire unit.

Improved Weight Distribution — Box A-frame allows location of main components for best over-all balance . . . putting more weight lower in tractor where it does the most good.

Service Simplicity — Since main frame carries *structural* load, power drive components can be readily removed, repaired or replaced without disturbing adjacent parts.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

Landfill garbage disposal speeded by Tournatractor



Dirt from next disposal trench is dozed over compacted refuse. Tournatractor's blade carries $2\frac{1}{2}$ cu. yds. of material. Unit shown belongs to Peoria Public Works Dept.

Many American cities have solved their refuse disposal problems with the sanitary landfill. This system eliminates odors, flies, and rat breeding opportunities and requires less equipment with lower operating costs than other methods of garbage disposal. On a long-term basis, it fills worthless land to convert it into valuable real estate.

With the landfill method LeTourneau-Westinghouse rubber-tired equipment has a big advantage over other machines.

With Tournatractor, for instance, you can use dozer blade or towed scraper to dig a trench. No shovel or trucks needed. No slow-moving crawlers. One man and one machine can do the complete trenching job.

For covering, Tournatractor also works alone to doze truck-hauled garbage into



Tournatractor spreads truck-dumped garbage . . . solidly compacts refuse and cover dirt during normal travel over the trench.

the trench, and to put on the desired layer of stockpiled dirt. If sufficient cover earth is not available nearby, Tournatractor's 19 mph speeds make practical long-distance dozing or hauling of cover. Because of this speed, job figures show that Tournatractor will do the landfill job 2 to 3 times as fast as crawlers of comparable size.

Extra time may be used to handle scattered maintenance-type jobs or to move to another dump. Tournatractor drives anywhere at a moment's notice . . . does not damage concrete or blacktop. With Tournatractor, you drive safely through traffic . . . can get to a job 2 miles away in 5 to 10 minutes.

If you have a garbage disposal problem, ask your local Distributor for all the facts on the landfill method of refuse disposal. He will gladly help you plan a program that will get rid of the unsanitary conditions of an open dump, and, at the same time, give your community improved land which can be used for recreation, or be profitably returned to the tax roll through sale to private owners. Your local banker can probably help you set up a municipal corporation to finance this plan, so that you need not draw on current operating funds.

If you would like to see Tournatractor in action, your LeTourneau-Westinghouse Distributor will also be happy to arrange a demonstration for you.

Tournatractor—Trademark T-339-G-zw

LeTourneau-Westinghouse Company

PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company



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of Westinghouse Air Brake. Seaman Motors has been merged with Andwall, which is a subsidiary of American Marietta. If this keeps up, the big ones will all be bigger and, pretty soon, there won't be any little ones left.

People in the Highway Business

—Bert Tallamy, long-time administrative head of the department of Public Works of the State of New York, has been replaced by John W. Johnson; Mr. Tallamy retains his post as chairman of the New York State Thruway Authority. Ray Bollen, formerly testing engineer for the Nebraska Department of Roads and Irrigation, has been named to the staff of the Highway Research Board. A matter of deep regret was the recent untimely death of Ted Matson, director of the Yale University Bureau of Highway Traffic and a pioneer in the field of traffic engineering. John Robertson, director of highways of the District of Columbia, was elected president of the American Road Builders' Association for 1955. George Dent, formerly Division Engineer, has been promoted to Assistant Chief Engineer of the Asphalt Institute; headquarters of the Institute are now at the University of Maryland, College Park.

From Here and There — Claims of the trucking industry of unfair treatment in Ohio as a result of the imposition of the controversial "axle-mile" tax are fully justified, according to a recent report issued by the Battelle Memorial Institute, an independent research organization. In December, the Oklahoma Turnpike Authority sold \$68 million of bonds to finance construction of a toll road from Tulsa to the northeast corner of the state, near Joplin, Mo. The downward trend of the cost index for highway construction in California halted abruptly during the third quarter of 1954, with the index showing a sharp increase over the previous quarter. Information released by the Associated General Contractors shows that 1954 was a record year for American construction, with the performance of an estimated \$52 billion of work; 1955 may be even larger. Claims for EC 999 AN, the mixture developed by the German William Rademacher for incorporation in bituminous paving mixtures permanently to "de-ice" them, refuse to die; latest reports are of a successful installation in New Brunswick, Canada.

North . . . East . . . South . . . West . . .

KERRIGAN

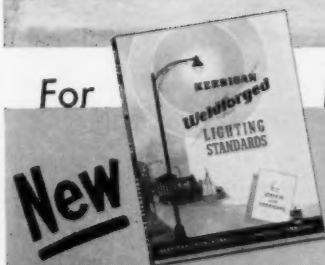
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Light the Way!

Tall, tapered and beautiful, Kerrigan Lighting Standards are *Weldforged* of high strength, low alloy steel. Maximum strength is combined with beauty of design to meet the highest engineering standards and conform to I.E.S. Street Lighting Codes.

Join the growing list of cities and towns all over the country now using Kerrigan *Weldforged* standards. Write now for your FREE copy of our new catalog.



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better lighted city streets the standard is Kerrigan!

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*are backed by 47
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Verti-Line Turbine Pumps are the result of almost half a century of experience in pump research, design, engineering, manufacturing.

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More than 100,000 satisfied vertical pump users agree there's no pump like Verti-Line for low first cost, economical operation, and negligible maintenance.

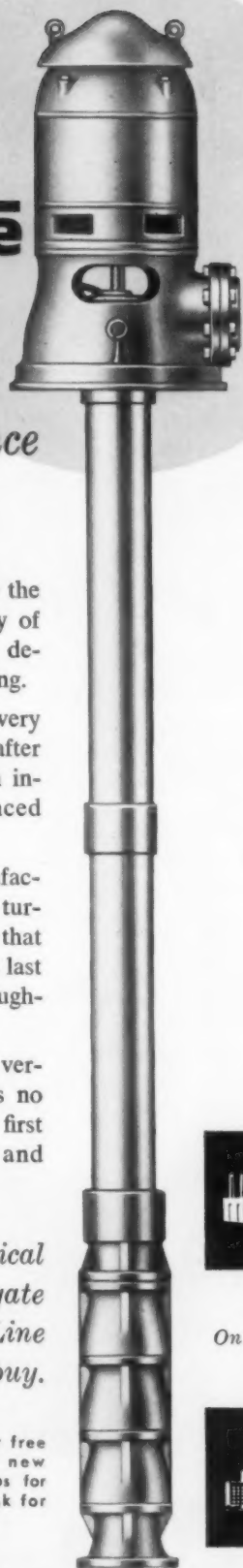
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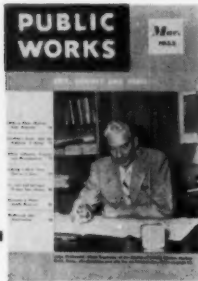
*In
All Industry*



On the Farm



For the City



LEADERS IN PUBLIC WORKS

C. L. Baylor is Village Engineer of the Village of Downers Grove, Illinois, just outside Chicago. He has held this position since 1942 and he is responsible for the engineering of all projects for the Village, including street maintenance and construction, water works and parking lots, and for supervision of these, except in the case of streets.

He is a member of the American Public Works Association and, at present, is President of the Chicago Metropolitan Chapter. He is also a member of the American Water Works Association and a Trustee of the Illinois Section. Membership in other societies includes the Western Society of Engineers and the National Society of Professional Engineers. He is a past president of the Suburban Building Officials Conference.

Mr. Baylor is married and he and Mrs. Baylor have one daughter. His hobby, he reports, is fishing.

Unusual Parking Provisions in Texas

Non-residents of Clarksville, Tex., when they overpark find a note or courtesy ticket on their cars inviting them to a free cup of coffee at any cafe in town, the city picking up the check. This, of course, applies only to out-of-town cars. In Wichita Falls, Tex., those who park overlong and get a ticket get also a heavy paper envelope in which the amount of the fine is placed. This is deposited in special boxes located near the middle of each block. For out-of-town overparkers, the fine is waived if the driver signs and deposits the cards. But we suspect the welcome will wear thin for an out-of-town habitual overparker.

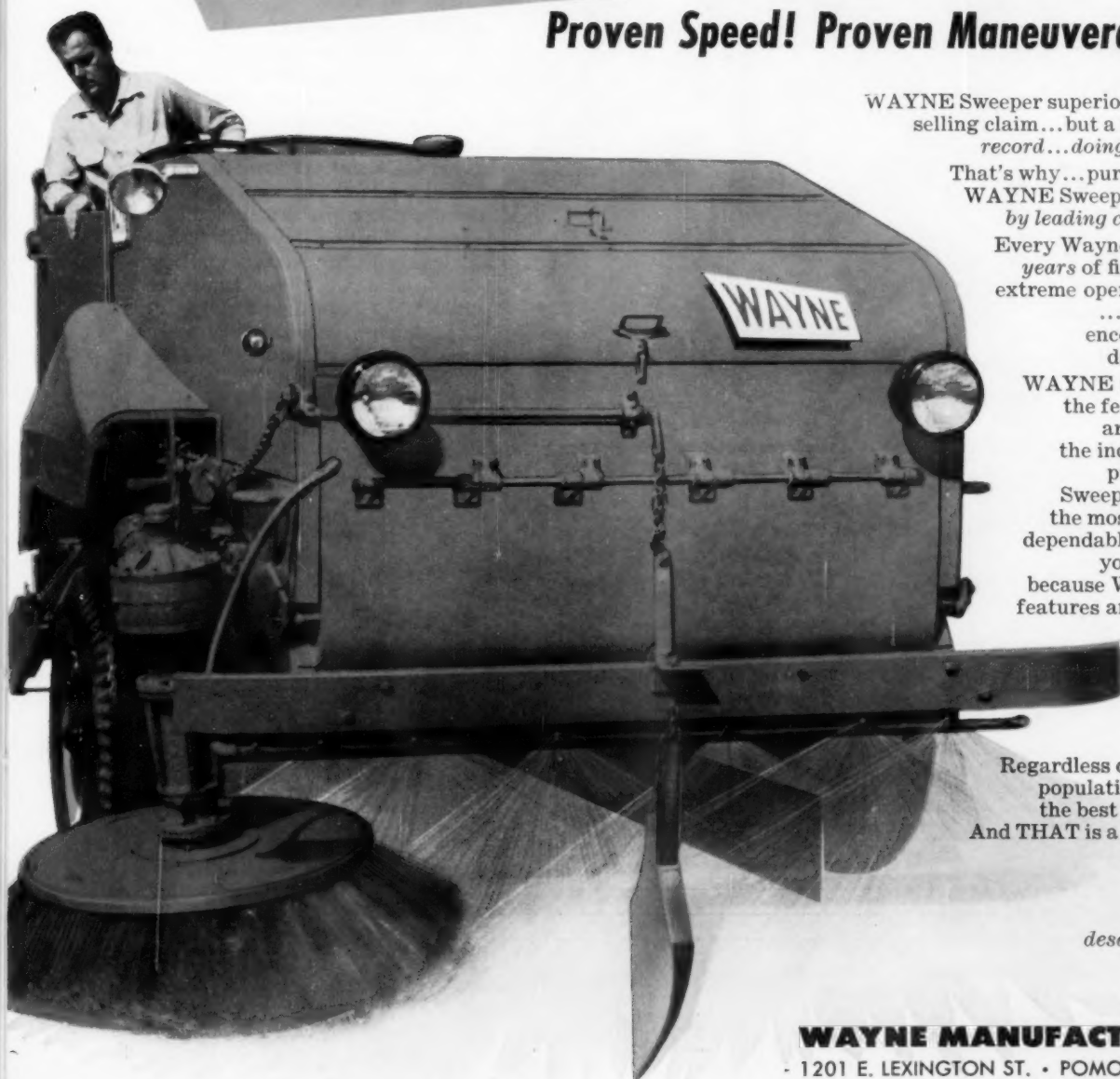
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WAYNE

STREET SWEEPERS

Proven Performance!

Proven Speed! Proven Maneuverability!



WAYNE Sweeper superiority is not a mere selling claim... but a matter of *proven record... doing a job, on the job.*

That's why... purely and simply...

WAYNE Sweepers are *preferred by leading cities in America!*

Every Wayne feature has had *years* of field-testing under extreme operating conditions... far beyond those encountered in usual day-to-day service.

WAYNE made *practicable* the features that today are the standard of the industry. When you purchase WAYNE Sweepers, you invest in the most advanced, most dependable street sweepers you can buy. That's because Wayne's exclusive features are *tested* features.

Regardless of area, terrain or population, WAYNE does the best job at lower cost! And **THAT** is a matter of record!

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World's Largest Manufacturer of Street Sweepers

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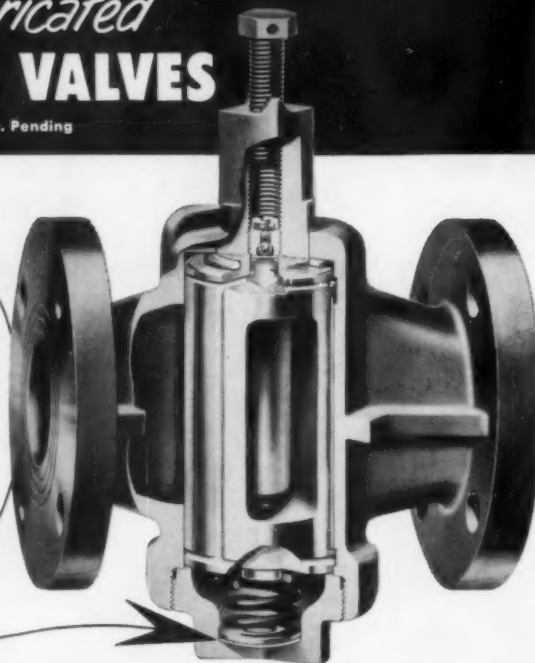
12 REASONS WHY YOU SHOULD BUY AND USE *LOW-PRICED*

HOMESTEAD

Lubricated PLUG VALVES

Pat. Pending

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Low friction Teflon washer permits spring to turn with plug. This means that less maintenance and longer life are assured, because the spring is subjected to compression only.

This is only one reason why you should **BUY AND USE, low priced HOMESTEAD LUBRICATED PLUG VALVES.**

HERE ARE ALL TWELVE

1. Reinforced Teflon packing ring.
2. Completely controlled high-pressure lubricant system.
3. 100% pipe area and venturi patterns.
4. No spring torsional stress.
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6. Two lubricants handle most services.
7. Extremely close tolerance between sealing surfaces.
8. Triple head-seal with Lubricant and Teflon packing ring.
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10. Leak-proof, double-ball-and-lubricant-sealed check valve.
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12. Extruded lubricant shows a full protecting system.

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LETTERS TO THE EDITOR



NAVY SANITARY ENGINEERING

Your editorial appearing on Page 7 of the February, 1955, issue of Public Works is excellent, but your comment "The Navy has never had any idea of what Sanitary Engineering can do" is somewhat erroneous.

The Bureau of Yards and Docks of the Navy Department early in World War II was aware of the deficiency in connection with water supply and sanitary engineering, and on the 10th of August, 1943 set up a program administered through Field Offices of the Bureau in order to expedite construction, and to handle other problems of the Bureau at the field level. The United States, including Alaska, and Aleutian Islands, was divided into seven areas. A Civil Engineering Corps Rear Admiral was assigned to each area as Superintending Civil Engineer. He had a small staff of Specialist Officers, one or more of whom was a qualified Sanitary Engineer. Among the personnel assigned were the following men, most of whom you know personally: Capt. F. H. Dechant, Capt. H. O. Lord, Cdr. W. R. Benford, Cdr. P. L. McLaughlin, Lt. Cdrs. R. Hazen, Heck, and the writer. There were also several civilian Sanitary Engineers assigned to the various activities.

At the end of the war when the above named officers were released to inactive duty, and the SupCE organization was disestablished the Sanitary Engineering Program was continued under the District Public Works Officer of the several Naval Districts. R. E. Sherman holds that responsibility in the Third Naval District, and R. S. Gleason, who was the writer's civilian assistant in the war is still the Sanitary Engineer attached to the Thirteenth Naval District. I am not presently familiar with the Engineers on duty in the other Naval Districts.

In addition to the above named

Breaking Chicago's Bottleneck with a **BLAW-KNOX** BITUMINOUS PAVER ON WHEELS!

● Chicago and the Cook County Highway Department had a date! Dec. 1st had to see the completion of the last section of the North Side Outer Drive. Standard Paving Co. of Chicago had the contract. The job was two lanes, 48-ft. wide and over half a mile long. After seeing the Blaw-Knox Paver on a few hours' work they bought the machine and finished the job in 13 days in spite of several days of bad weather.

The pavement was 3 courses of I-11 — two base courses $1\frac{1}{2}$ " thick and a finish course $1\frac{1}{2}$ " thick. All courses were 12 ft. wide. The machine operated at 24 ft. a minute and handled 15 ton trucks. Output was materially reduced because of the long haul (12 miles) from the plant, but in spite of weather and haul the entire job including lighting will be completed long before the penalty date.

You can make money by paving on wheels!

BLAW-KNOX COMPANY
CONSTRUCTION EQUIPMENT DIVISION
1954 STATE STREET
NUNDA, NEW YORK

- ✓ Long wheel base and wheel steering assure greater accuracy and smoother course.
- ✓ Eliminates the 500 to 600 parts characteristic of crawlers.
- ✓ Tires absorb vibration, reduce chatter in screed and reduce wear and tear on machine.
- ✓ Handles boxcar trucks on grades with ease.
- ✓ Dual controls — operate machine from either side.
- ✓ Compacts to uniform density and automatically measures and levels.
- ✓ Leveling principle equalizes ordinary subgrade irregularities.
- ✓ Simple, easy crown adjustment.
- ✓ Conversion for increased width is easy and fast.
- ✓ Works close to curb.
- ✓ A sturdy frame you won't have to rebuild.
- ✓ The only floating screed paver with positive traction at all times.

*On wheels
it will pave
for less*



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that give a new meaning to "UTILITY"



Model 900 D
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1. Models to fit 40 different Chevrolet, Ford, International, GMC, Dodge and Studebaker chassis . . . single or dual wheel.
2. For $\frac{1}{2}$ - $\frac{3}{4}$ - 1 - and $1\frac{1}{2}$ -ton trucks.
3. 18 different compartment arrangements.
4. Exclusive 4-point coil spring body mounting.
5. Complete line of Service Accessories.
6. Bonderized, all-steel welded construction.
7. Double lap-type joints.
8. Extra-wide doors for easy access.
9. Larger, greater capacity compartments.
10. Embossed door panels for rigidity and appearance.
11. Fully recessed door handles.
12. All doors keyed alike.
13. Tumbler-type locks at no extra cost.

14. Full bolt-action locking bar.
15. Weatherproof compartments . . . lap-seal and gutter drain on all doors.
16. Raised bottoms of all vertical compartments provide extra protection for tools and supplies.
17. Heavy-duty reinforced 16-gage bulkheads.
18. Outside compartment headers 14-gage steel.
19. 4-way, 12-gage, safety tread non-skid floor.
20. From 25 to 35 sq. feet of floor loading area.
21. Through wheel housings for universal dual wheel application.
22. Reinforced tailgate.



Model 1050 D

23. Extra strength, bridge-type construction with interlocking lateral and longitudinal reinforcements.
24. Side boxes supported by one-piece cross members, reinforced at mounting holes.
25. Beaded fender panels hinged for easy access to wheels and spring shackles.

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• Also manufacturers of MOR-SUN Furnaces and ROLY-DOOR Steel Garage Doors

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organization there have been in the Bureau of Yards and Docks several career Sanitary Engineers, B. Lehnhart in the Construction Department, and H. W. Tipton in the Planning and Design Department. During World War II Cdr. Charles L. Pool and Lt. Cdr. W. A. O'Leary were also in the Design Department in the Sanitary Engineering Section under the Design Manager, Capt. E. H. Praeger.

The Sanitary Engineers assigned to the Bureau of Yards and Docks work in close liaison with the Bureau of Medicine and Surgery, and this latter Bureau has developed a Medical Service Corps since World War II.

Although this letter is somewhat lengthy it is necessarily so in justice to the Navy.

E. Arthur Bell,
Essex Fells, N. J.

NOTE by EDITOR: At least one other letter concerning Navy sanitary engineering will be published in an early issue. At that time the editor will add some comments based on his own experiences and background. In the meantime, he is happy that there are such evidences of strong interest in sanitary engineering in the Navy. It should be borne in mind, however, that his references in the February editorial were primarily to the public health phases of sanitary engineering and to overseas operations.

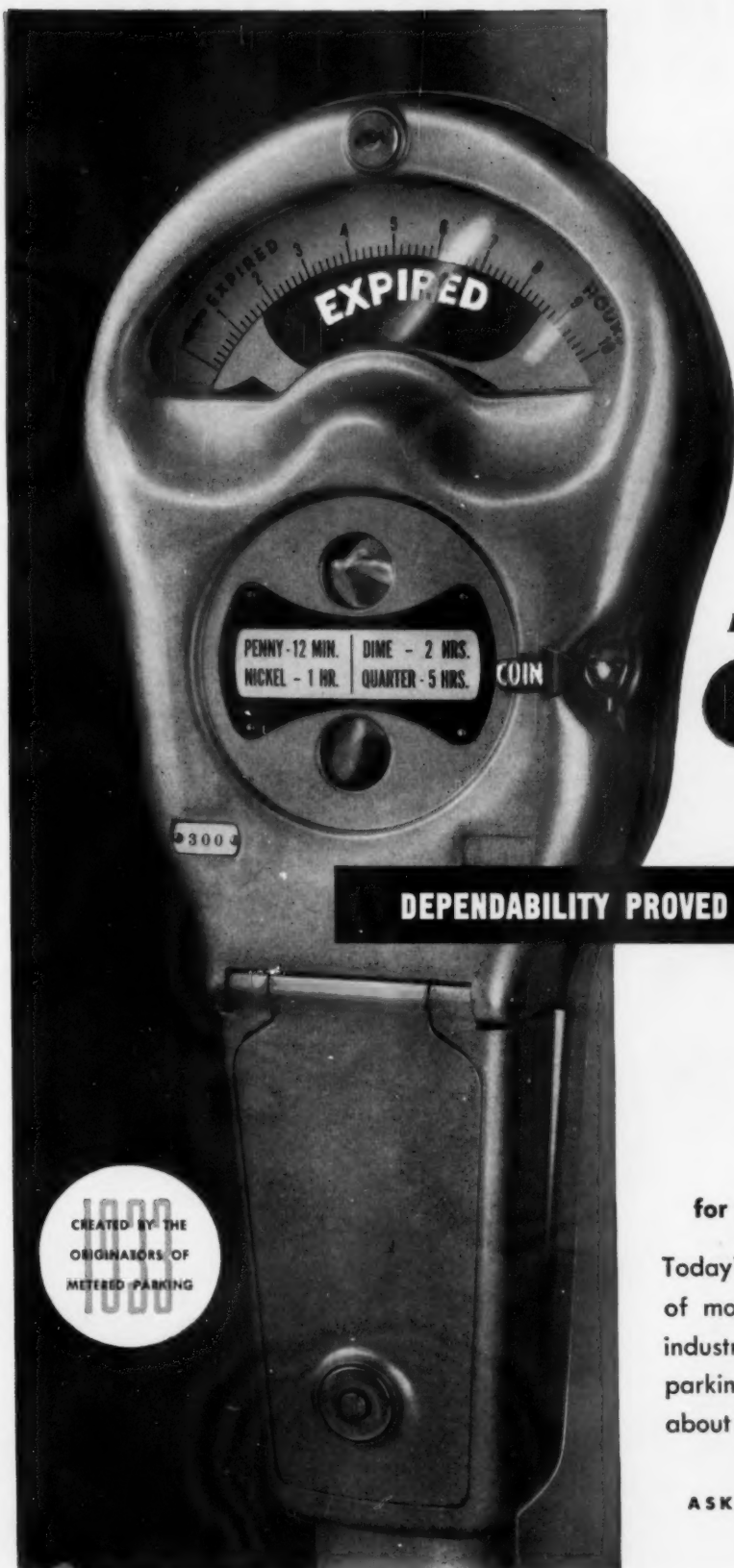
RADIOACTIVITY AND FILTRATION

In the "Water Works Digest" of your February issue reference is made to tests at a non-existent Troy, N. Y., rapid-sand filtration plant under the heading "Effects of Filtration on Radioactivity."

Actually the filtration plant in question is the Albany, N. Y., plant. All of the plant tests referred to were made on samples collected from the Albany system, as well as a large part of the tests made of the activity of rain, reservoirs, algae, etc., and also the tests made which indicated a return of the fission product concentration in uncovered distribution reservoirs to practically the same level as in the raw water.

H. C. Chandler

Supervising Chemist
Helderberg Filters
Albany, N. Y.



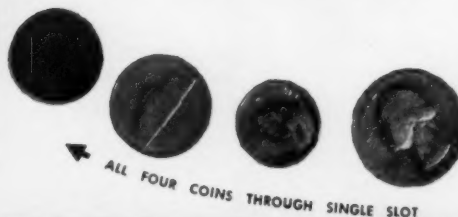
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AUTOMATIC

FULLY ACCUMULATIVE



DEPENDABILITY PROVED MILLIONS OF TIMES A DAY!

The World's Finest
Most Adaptable
Most Dependable
Most Remunerative
Parking Meter System
for on-street or off-street operation

Today's Park-O-Meter is the achievement of more than 20 years experience in the industry. It provides the solution to every parking problem. You should know all about it.

ASK FOR DESCRIPTIVE LITERATURE

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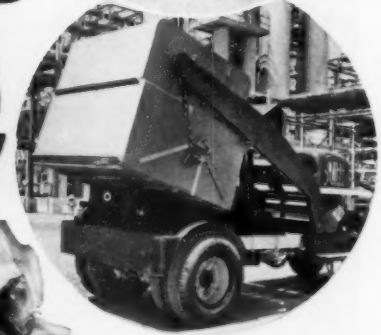
COMMERCE EXCHANGE BUILDING
OKLAHOMA CITY 2, OKLAHOMA

Get full details of this month's products... mail your Readers' Service card today.

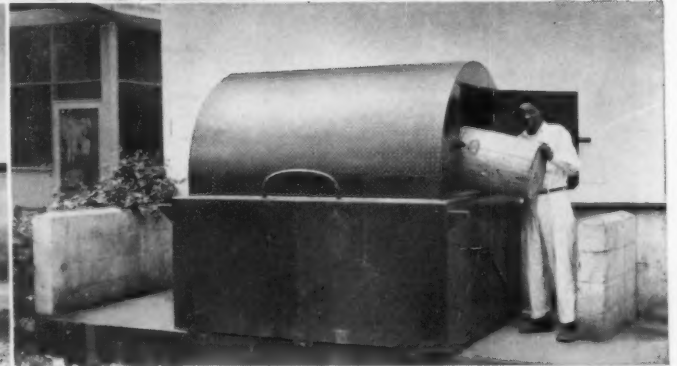
Here is the immediate solution refuse



The Dempster-Dumpster is operated by only one man, the driver, by means of hydraulic controls in cab. It picks up a loaded container, hauls to disposal area, empties (see photos here) and then returns it . . . serving one container after another.



This Lexington, Ky. groceryman had gone to the added expense of building a concrete platform to keep cans and crates full of garbage off the ground. He had done all he could within reason to make the best and most sani-



tary condition possible with conventional cans. Yet, look at the difference after the 10 cu. yd. Apartment Type Container replaced all the inadequate cans, crates, barrels, etc.

to the **FOUR** major bulk collection problems in any city!

1. **UNSANITARY CONDITIONS:** Health and Sanitation Departments are well aware of the disease spreading potential of unprotected rat and fly infested refuse.

2. **UNSIGHTLY CONDITIONS:** Every citizen is conscious of the conditions caused by wind and scavengers scattering trash and refuse over alleys and streets.

3. **FIRE HAZARDS:** Fire Departments know too well the extent to which property is damaged and gutted by fires resulting from unprotected accumulations of trash, rubbish, inadequate trash cans, boxes, etc.

4. **HANDLING COSTS:** The cost of crews in the slow process of re-handling and loading trash and refuse is tremendous. Conventional trucks standing idle, waiting to be loaded, is a costly waste of equipment time.

All four of these bulk refuse collection problems can be quickly and completely solved by the Dempster-Dumpster System. Problems one, two and three are solved by the big steel Dempster-Dumpster Containers. These containers have self-latching doors and lids, keeping refuse out-of-sight between deposits by users. No rats or flies can contaminate the refuse. Winds and scavengers cannot scatter it. Fire hazards are elimi-

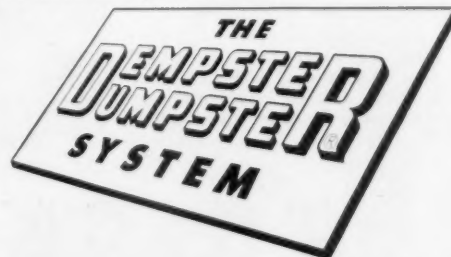
nated. The fourth problem, rehandling costs, is solved by one truck-mounted Dempster-Dumpster and the driver serving numerous containers one after another.

Actual reductions in collection costs have ranged from 50 per cent up in cities where the Dempster-Dumpster has been installed. Without question, this system is recognized as the most sanitary and lowest cost method of bulk refuse collection ever devised. When, with this system, you can be assured of amazing cost reductions in service, with Sanitation, Citizen approval and Fire Prevention thrown in, it is worthy of investigation. Ask us to forward further information. Manufactured exclusively by Dempster Brothers, Inc.



The scene above was photographed in Pampa, Texas after the Dempster-Dumpster System was installed last year. One Dempster-Dumpster serves 33 detachable containers, ranging in capacity from 8 to 12 cu. yds. This equipment will be completely amortized by the city by savings in about four years.

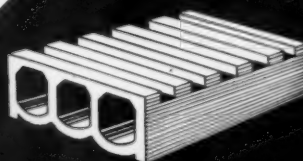
The two photos at left show what happens when the Dempster-Dumpster Detachable Containers replace conventional cans in a typical housing area. Without the trash and garbage cans this area is an ideal place for children to play. Note that one 6 cu. yd. Apartment Type Container replaced some 14 conventional cans. Instead of a conventional truck with crew rehandling the refuse from cans to truck, a Dempster-Dumpster with only one man, the driver, will serve the loaded containers. There is no rehandling of refuse whatsoever.



DEMPSTER BROTHERS
935 Dempster Bldg.
Knoxville 17, Tennessee

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blocks for your trickling filter.



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| <p>1 LOW COST Overall outlays are generally lower, in the combination of initial and operating costs.</p> <p>2 EASY TO OPERATE Any intelligent man, willing to learn how to perform a few simple tests, can run your plant.</p> <p>3 OPERATE AUTOMATICALLY Can be equipped with automatic controls so that in all ordinary circumstances they operate efficiently.</p> | <p>4 LONG LIFE Trickling filters are built for long life, to outlive the bonds you issue to pay for them.</p> <p>5 GOOD RESULTS Top-notch efficiency — say 20 ppm BOD — day after day. Your consulting engineer can design for quality of effluent you need.</p> <p>6 OVERLOAD NO PROBLEM Take temporary shock loads in their stride. A new industry in your community offers no new problem here.</p> |
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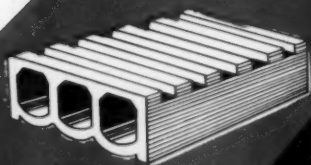
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Pittsburgh 22, Pa.

ARMCRE
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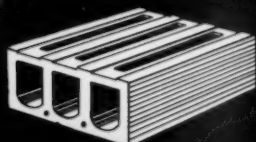
POMONA
Pomona Terra-Cotta Co.
Pomona, N. Car.

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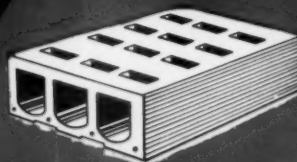
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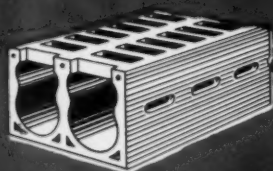
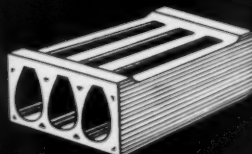
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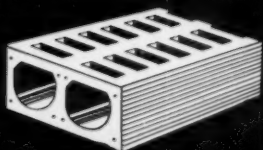
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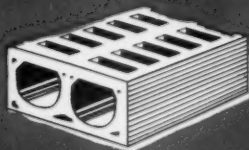
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(ARMCRE)

NATCO



ARMCRE



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Homer A. Hunter, consulting
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Plant includes one 65' primary
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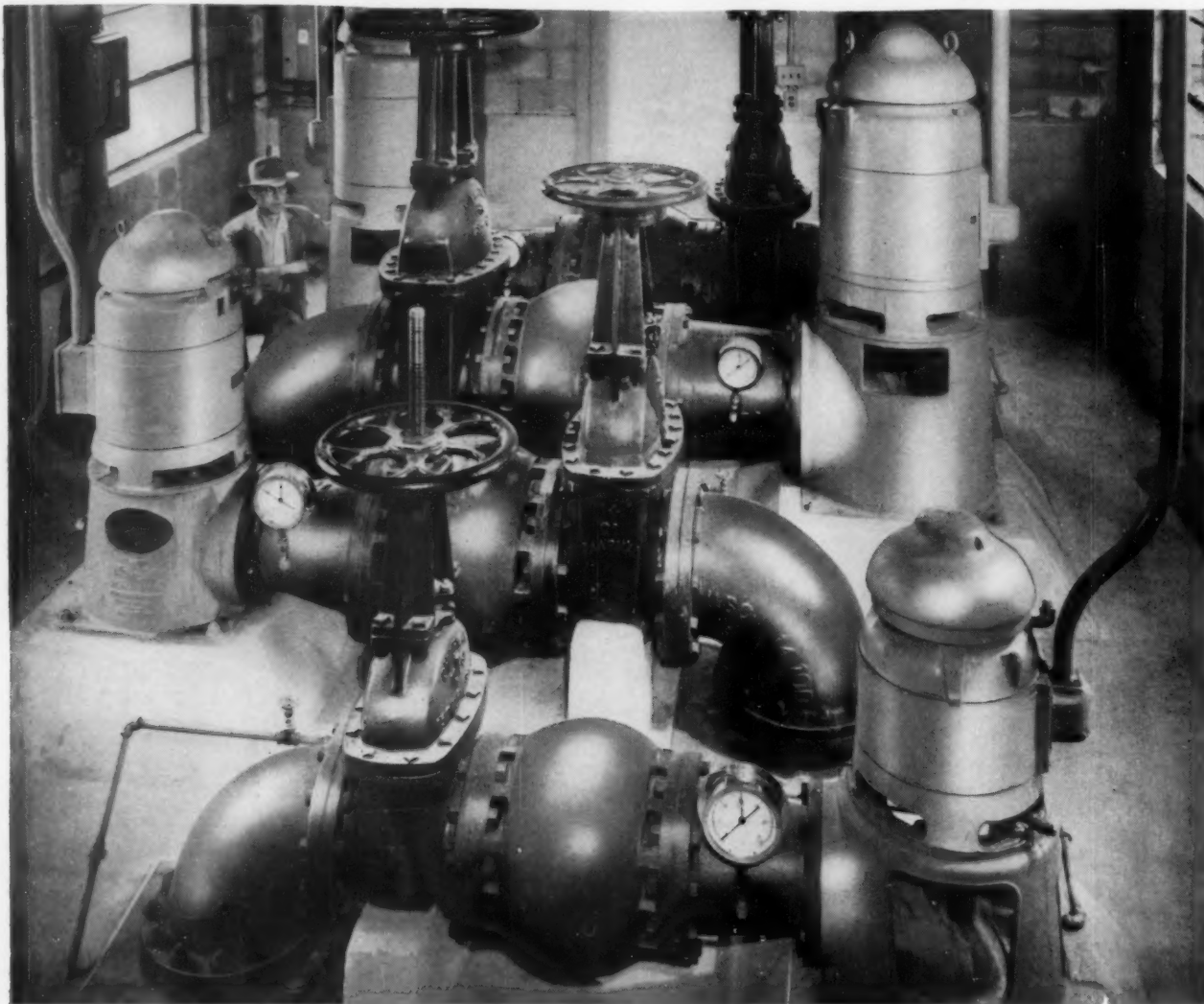
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Now's the time to mail this month's Readers' Service card.



FOUR WORTHINGTON VERTICAL TURBINE PUMPS deliver 14,500 gallons of water a minute to reservoir serving Van Wert, Ohio.

Versatile is the word for these pumps

Interesting thing about this new pumping installation for the city of Van Wert, O., is that four Worthington vertical turbine pumps, usually used for deep-well service, are delivering water from a shallow creek.

This type of pump was recommended after consultation with Van Wert engineers because it needs no priming devices, suction lines, or dry-pit construction. Moreover, its vertical design takes up less space than

other types. The Worthingtons have proved a wise choice — they're highly efficient, their operating cost is remarkably low, and maintenance is practically nil.

We can help with *your* pumping problem, too. Just how, is made clear in our Bulletin W-450-B40. Write for it. Worthington Corporation, Vertical Turbine Pump Division, Section D.4.30, Succasunna, New Jersey, or Denver, Colorado.

D.4.30

"See the Worthington Corporation Exhibit in New York City. A lively, informative display of product developments for industry, business and the home. Park Avenue and 41st Street."

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CONSERVE GROUND WATER—IT IS A VALUABLE RESOURCE

Get full details of this month's products... mail your Readers' Service card today.

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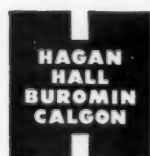
Calgon

Calgon* provides the simple, effective and *economical* answer to these and many other water works problems. Calgon stabilizes iron and manganese dissolved in water, prevents iron pickup from pipes—Red water is stopped.

Corrosion control with Calgon† is effective against tuberculation, keeps flows high and pumping costs low. Call on Calgon for the solution to your specific problem. Years of experience with water problems of all types in every part of the country are at your service.

*Calgon is the Registered Trade Mark of Calgon, Inc. for its glassy phosphate (sodium hexametaphosphate) products.

†Fully licensed for use under U.S. Patent 2,337,856 and 2,304,850.



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Need more facts about advertised products? Mail your Readers' Service card now.

FREE

EQUIPMENT DATA to Help Your PUBLIC WORKS PROGRAM

NEW LISTINGS

Be Sure to Investigate These Parking Meter Features

146. Parking meters designed for greater public convenience, unlimited flexibility with easy adjustment of time limit rate and coin acceptance plus simplified enforcement inspection are described in the attractive bulletin of Magee-Hale Park-O-Meter Co., Commerce Exchange Bldg., Oklahoma City 2, Okla. Get all details on the Model H meter by checking the coupon.

Concrete Pavement Manual Offered

171. Details of design and principles of concrete pavement construction are presented in a 78-page manual published by the Portland Cement Assn., 33 W. Grand Ave., Chicago 10, Ill. Data from many sources is summarized in convenient form to help design and construction engineers. Check the coupon for your copy.

Heavy Duty Compressor Designed for Smaller Jobs



295. A new four-page bulletin illustrates and describes many exclusive Le Roi features found on the 85 cfm Airmaster. Engine and compressor are of one-unit design and provide construction features rarely found in the smaller compressors. Ease of operation, maintenance and mobility allows the 85 to do more hard,

heavy-duty work. To get full data write to Le Roi Div., Westinghouse Air Brake Company, Milwaukee 14, Wis., or check the coupon.

Spreader Handles Aggregate and Asphalt

127. A hopper-type spreader which hooks to any standard dump or semi-dump truck and handles both aggregates and hot or cold-mix asphalt has been introduced by Good Roads Machinery Corp., Minerva, Ohio. Materials can be spread uniformly to any thickness up to 8 inches. Get full data on the many advantages of this unit by checking the coupon.

The engineering information in these helpful catalogs will aid you in your Engineering and Public Works programs. Just circle numbers you want on the coupon, sign and mail. This free Readers' Service is restricted to those actively engaged in the public works field.

Surveying Instruments— Basic Tools for the Engineer

282. A comprehensive catalog showing all items in the Warren-Knight line of engineering and surveying items is now available from Warren-Knight Co., 136 North 12th Street, Philadelphia 7, Pa. This eleventh edition of their general catalog has 56 pages and is packed with helpful data on instruments and THEIR care. Check the coupon for your copy.

Effective Shredder for Dried Sewage Sludge

45. The rugged and compact Royer Shredder does a quick and effective job of dewatering sludge cake to produce a good fertilizer for use on city properties or for sale to others. Six sizes, 6 to 150 c. y. per hour, electric, gas-oil or power takeoff, stationary or portable are described in Bulletin 55-RS. Write Royer Foundry & Machine Co., Kingston, Pa., or check the coupon for your copy.

Handbook of Cast Iron Pipes and Fittings

52. Full engineering data on products of the Alabama Pipe Co., including Super De-Lavaud cast iron pressure pipe and pipe fittings, valve boxes and other municipal castings are provided in Pressure Pipe Catalog No. 54, a 196-page publication of Alabama Pipe Co., Anniston, Ala. Weights, dimensions and specifications are clearly indicated in this easy to use reference. Requests for this valuable publication should be accompanied by your business letterhead.

Drill Concrete With Your Ordinary Electric Drill

130. Substantial cost-per-hole savings are claimed for Tilden rotary drills which penetrate up to 6 ins. of concrete per minute. Cuts right through reinforcing steel. Cutters can be sharpened. Full data from Tilden Tool Mfg. Co., 209 Los Molinos, San Clemente, Calif. Check the coupon today.

Latest Data on Standards For Traffic Control Signals

258. All-aluminum standards and brackets for mounting traffic signals over roadways and pedestal-type bases for signals mounted on the curb are described in a bulletin of Pfaff & Kendall, 84 Foundry St., Newark 5, N. J. Check the advantages of these maintenance-free units when planning new installations and replacements. Use the coupon to get latest data.

Tablet Hypochlorinator Offers Extra Convenience

262. Economy, safety and convenience plus accurate dosage control are offered by HTH tablets and the tablet hypochlorinator. The principles of operation, applications and details on three hypochlorinator models which provide a range of dosage rates are covered in a 26-page bulletin, available from Olin Mathieson Chemical Corp., Industrial Chemicals Div., Baltimore 3, Md. Check the coupon for your copy.

Engineering Data on Incinerator Design

118. A comprehensive bulletin which provides full engineering data on municipal refuse incineration is offered by Pittsburgh-Des Moines Steel Co., 3422 Neville Island, Pittsburgh, Pa. This 20-page booklet shows basic requirements for satisfactory incineration, gives incinerator design details and describes modern mechanical stoking, construction features and modernization of existing plants. Get your copy by checking the coupon.

Helpful Reference on Swimming Pool Equipment



pool maintenance. Get your copy of this 44-page book by checking the coupon.

Laboratory Testing Services For the Construction Field

80. Services for construction offered by the United States Testing Company, Inc., Hoboken, N. J., are demonstrated in an attractive 8-page bulletin which is accompanied by a convenient check list for architects and engineers. You will find every type of product listed, including steel and concrete, soils, pipe, paint and many others. Check the coupon for this useful data.

Proper Installation of Bituminized Fibre Sewer Pipe

105. A well-planned instruction leaflet showing the proper step-by-step procedure for installation of Bermico bituminized fibre sewer pipe has been made available by Brown Co., 150 Causeway St., Boston 14, Mass. To make sure of best results in pipe installation, just check the coupon for your copy.

3-55

USE THIS COUPON to get detailed information

on products and materials mentioned in this issue.
Circle numbers below and mail today.

Booklets from pages 32 to 50:

20	30	33	35	39	44	45	48	49	51
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110	112	114	115	116	118	120	121	126	127
129	130	133	135	146	147	150	154	158	161
162	167	168	171	172	173	177	182	186	191
193	194	195	196	202	204	205	206	207	211
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248	250	255	258	260	262	264	265	275	277

278	282	283	287	288	292	293	295	298	304
305	308	309	312	313	316	317	318	322	326
330	333	341	345	355	359	361	363	368	371
374	385	391	393	396	398	399			

New Products, pages 170 to 175:

3-1	3-2	3-3	3-4	3-5	3-6	3-7
3-8	3-9	3-10	3-11	3-12	3-13	3-14
3-15	3-16	3-17	3-18	3-19	3-20	3-21
3-22	3-23	3-24	3-25	3-26		

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The Super 55 offers diesel or gasoline engine. Equipment shown is Oliver 1000-pound loader and Danuser 3-point hitch blade.

In features, versatility... OLIVER SUPER 55 is years ahead!

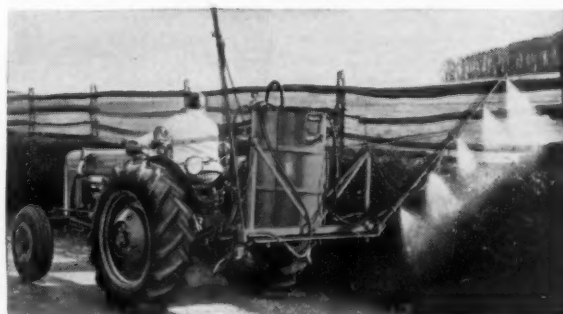
From every angle, this new Oliver is years ahead in power, flexibility, handling ease and utility than any tractor of comparable size!

Only the Super 55 gives you a choice of two engines—diesel or gasoline. You pick the one that fits your work the best, saves the most. You pick the equipment you want, too—3-point hitch, front or side mounted. Built-in hydraulics operate all three types.

The Super 55 is low and compact, built to the size that lets you work anywhere. Its light-handling ball-type steering and double-disc brakes make maneuvering in tight quarters easy. And with six forward speeds—five working speeds, one road speed—you select the gear for each job, do more on less fuel than ever before.

You'll be surprised at the low price of this years-ahead tractor. Why not try the Super 55 yourself? Phone or visit your Oliver Industrial Distributor for a demonstration.

THE OLIVER CORPORATION
400 West Madison Street, Chicago 6, Illinois



Here is the Super 55 with 3-point hitch Oliver Iron-Age weed sprayer. Oliver also offers many other mounted and pull-type sprayers.



This universal frame is hydraulically operated from the built-in hydraulic system. Takes bulldozer blade, angle blade and snow plow.

NEW LISTINGS (cont.)

Technical Bulletin on
Cyanide Wastes

78. The use of chlorine and hypochlorites for the treatment of cyanide wastes is the subject of a new 16-page technical service bulletin offered by Columbia-Southern Chemical Corp., 1 Gateway Center, Pittsburgh 22, Pa. Methods of application, operating details and equipment are covered, together with flow charts of various treatment methods. Check the coupon for your copy.

What You Should Know
About Fluoridation

217. A helpful publication entitled "Fluoridation" which describes the development of fluoridation and lists the chemicals and dosages normally used has been prepared by Wallace & Tiernan Inc., 25 Main St., Belleville 9, N. J. Copies of publications on both solution and dry feed W&T Fluoridators are also available. These publications are yours for checking the coupon.

Where Treated Posts
Are Used on Highways

231. The 16-page "Highway Post Booklet" published by the Wood Preserving Division of Koppers Co., Inc., Pittsburgh 19, Pa., provides detailed descriptions of the use of pressure-treated highway posts. Pertinent facts concerning installation, maintenance and length of service, cost comparisons and actual case histories from state highway departments are included. Check the coupon for your copy.

Portable Hot Asphalt
Paving Repair Unit

250. Maximum economy in paving repair and maintenance is claimed for the compact "Patchmobile" which has a rotary tube continuous dryer, batching hopper for accurate proportioning, twin hot asphalt tanks, heat jacketed pugmill, tool heaters and hand spray bar. Get latest data from Wylie Mfg. Co., 5926 N. W. 39th St., Oklahoma City 12, Okla. Use the coupon.

Faster Cuts in
Concrete Pavement

317. Clean, fast cuts in green or cured concrete and asphalt pavements are easily made with the powerful Champion concrete saw. Perfect balance and "either-side" blade arrangement helps speed the work when sawing joints and cutting outlines for patches. Get full details from Champion Mfg. Co., 2028 Washington Ave., St. Louis 3, Mo. Just check the coupon.

Latest Data on
Performance Tested Sweepers

322. Be sure to investigate the outstanding features of Wayne motor pick-up sweepers, fully described in literature of the Wayne Manufacturing Co., 1201 East Lexington St., Pomona, Calif. Effective sweeping, speed, maneuverability and operator convenience are backed up by performance records. Get latest data by checking the coupon.

Investigate "Tifa"
For Insect Control

308. With "Tifa", the Todd Insecticidal Fog Applicator, chemicals are distributed as a true, clean fog. Use coupon for full data on public health programs. Combustion Equipment Div., Todd Shipyards Corp., 81-16 45th Ave., Elmhurst, N. Y.

New M-B Packer Body
Designed for Maximum Payload

309. The M-B Packer Body, designed to provide maximum payload on a minimum size, low-cost truck, features effective, simple compaction system; provides easy loading, positive discharge, all safety features. Available in 12-14-16 yd. capacities. Get all the facts from M-B Corporation, New Holstein, Wis. by checking the coupon.

How to Get Better
Concrete Construction

313. A report on the use of "Pozzolith" as a means of increasing the strength and dur-

ability and reducing the permeability of concrete structures, while reducing costs at the same time, is presented by Master Builders Co., Cleveland 3, Ohio. Check coupon for your copy.

WATER WORKS

Data on Cutting-In Valves,
Repair Sleeves and Accessories

33. A variety of Clow products for installation and repair of cast iron pipe lines, including the Eddy cutting-in valve and sleeve, split sleeves for pipe repair, test plugs, valve boxes, Strickler pipe cutters and other fittings and accessories are featured in literature available from James B. Clow & Sons, Inc., Box 6600-A, Chicago 80, Ill. Check the coupon.

Technical Data on Fluorides
And Other Chemicals

48. Technical data on fluorides and other chemicals will be found in a comprehensive booklet issued by Blockson Chemical Co., Joliet, Ill. This helpful 60-page booklet includes a great deal of general information of value to water works men. Get a copy by checking the coupon.

Helpful Data on
Water Works Products

49. A completely new catalog covering the entire line of water distribution and service products offered by the Mueller Company, of Decatur Ill., is now available to engineers and water works superintendents. The 328-page catalog features an easy-to-use sectional indexing arrangement to facilitate quick reference to any of the hundreds of products listed. A large section of useful engineering information is included. Check the coupon today.

"Our ROYER has eliminated our last major plant problem"

from an Ohio sewage treatment plant*



This sewage treatment plant had a problem of sludge disposal. The cost of incineration was prohibitive and the sludge could not be disposed of in caked form as fertilizer, even without charge.

In April 1954 they purchased a Royer Sludge Disintegrator and during the first seven months of operation earned 90% of its cost. They are currently selling their entire output of completely shredded, pulverized, trash free, ready-to-use fertilizer at \$5.00 per cubic yard. In addition to replacing a cost of disposal with a cash income, they have built up good will with the citizens of their community by supplying an easily handled, useful fertilizer at a moderate cost.

Write for details on this "income producing" equipment.

Available in capacities from 1 to 150 cubic yards per hour in electric motor, gasoline engine or belt-to-tractor drives. Turn an "expense" item into a "profit" with a Royer.

*name on
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ROYER foundry & machine co.

157 PRINGLE ST., KINGSTON, PA.



Now's the time to mail this month's Readers' Service card.

Send for **NEW** 28-page guide to **LINK-BELT SCREENING EQUIPMENT**



Thru-Clean Screens

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If your operations involve removal of solids from water, sewage or industrial waste —

Link-Belt's new Book 2587 is important reading for you. It gives complete dimensions and specification data for four types of coarse screens for removing large solids . . . and three types of fine screens for small solids removal. To help determine your exact need, there are tables indicating the proper size unit for various capacities. In addition, Book 2587 contains over 30 photographs of screening installations and outstanding examples of Link-Belt sanitary engineering. Send for your copy now. Clip the coupon at right and mail today.

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13,759

LINK-BELT COMPANY

307 N. Michigan Ave., Chicago 1, Ill.

Please send a copy of New Book 2587 on Link-Belt Screening Equipment.

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P.W.

Get full details of this month's products . . . mail your Readers' Service card today.

Meter Features That Help Make Water Works Profitable

59. Simple design, accuracy and long life, moderate first cost and inexpensive maintenance are features of American water meters described in Bulletin No. 55 of the Buffalo Meter Co., 2917 Main St., Buffalo 14, N. Y. Be sure you have this informative booklet which gives the details of American meter design and construction plus full data on sizes, capacities and dimensions. Get your copy by checking the coupon.

Efficient Coagulation With Ferri-Floc

69. Advantages claimed for Ferri-Floc as a coagulant include wide pH range, quick floc formation, manganese removal, control of certain tastes and odors, plus other aids in high quality water production. Check coupon for complete Ferri-Floc data. Tennessee Corp., Grant Bldg., Atlanta, Ga.

96 Page Book Helps Solve Water Problems

71. pH and Chlorine Control. A discussion of pH control and description of comparators, colorimeters and similar devices. A 96 page booklet. W. A. Taylor Co., 7304 York Road, Baltimore 4, Md.

Useful Data on Butterfly Valves

100. Complete descriptions and tables of dimensions on the full line of Rockwell Butterfly Valves are contained in several bulletins published by the company. Construction details and special control features are illustrated. Write W. S. Rockwell Co., Eliot Street, Fairfield Conn.

Specs for Gate Valves

112. Rigidly inspected gate valves for pressures up to 175 lbs. by R. D. Wood Co. Sizes 2" to 30"; for any standard type joint. R. D. Wood Co., Public Ledger Bldg., Philadelphia 5, Pa.

Water Treatment Unit For Small Supplies

87. A complete-package water treatment unit to treat 5 to 100 gallons per minute is described in Bulletin 1870, issued by Inflico Inc., Box 5033, Tucson, Ariz. Unit softens, clarifies, sterilizes or removes organic matter, tastes or odors. Requires a minimum of attention. Investigate this unit whenever dependable treatment is needed for small domestic supplies. Check the coupon today.

How to End Hard Water Troubles

106. Permutit water softeners are described in a well illustrated, 20-page booklet which describes the principles of operation, design features, advantages and specifications of zeolite (cation exchange) water softeners. Both automatic and manually-controlled units are described. To get a copy of this helpful publication. Bulletin 2386A, write The Permutit Co., 330 West 42nd St., New York 36, N. Y. or check the coupon.

Discussion of Ranney Method For Municipal Water Production

116. A very interesting study of municipal and industrial water supply problems and a complete discussion of Ranney Collectors for water production will be found in a 20-page booklet published by Ranney Method Water Supplies, Inc., Box 5415, Columbus 19, Ohio. Water quality, construction methods, costs, performance and other topics are considered. Check the coupon to get your copy.

Pipe Detector Determines Exact Location and Depth

120. Determination of the exact location and depth of buried pipes, valves, service cables and other metallic objects can save costly digging and unnecessary damage. Your work can be speeded when you use the Detectron pipe detector, which features simple operation, shielding to avoid static interference, economical unit construction and a lifetime guarantee. Get full data from Detectron Co., 5528 Vineland Blvd., No. Hollywood, Calif., by using the coupon.

How Accurate Boring Speeds Underground Pipe Installations

135. Interesting charts showing earth boring costs, speed and accuracy for holes from 2½" to 14½" diameter and up to 80 feet long are included in 16-page Catalog No. 8 issued by Hydrauger Corp., 681 Market St., San Francisco 5, Calif. Specifications and general operating instructions are also covered.

Sewer Design Flow Chart Based on Manning Formula

154. A large-scale, convenient flow chart based on the Manning formula, together with typical examples of use, is available from Johns-Manville, 22 East 40th St., New York 16, N. Y. To get your copy check the coupon or write to the manufacturer and ask for Bulletin TR-94A.

Helpful Data on Sluice Gates

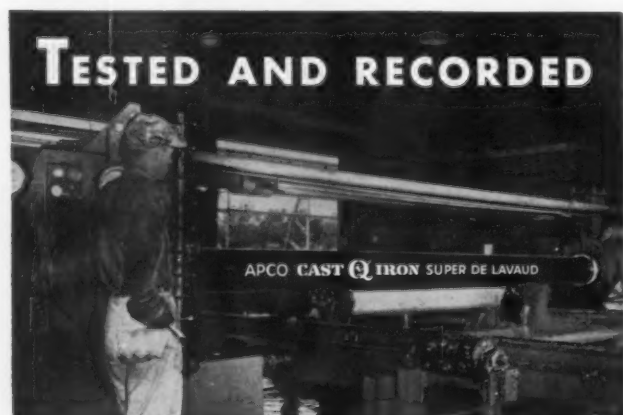
158. In a well-organized 48-page catalog you will find complete engineering and design data on Pekrul sluice gates, headgates, automatic flap gates, lifts and accessories. Numerous models in 6" to 92" sizes are available, and all pertinent data will be found in this helpful booklet. Write Morse Bros. Machinery Co., Denver, Colo., or use the coupon.

Get Data On Magnesium Anodes For Corrosion Protection

161. The use of magnesium anodes to protect pipe lines and other structures from the corrosive effects of aggressive soils is discussed in the bulletin "Plug Corrosion Leaks" issued by Pipe Line Anode Corp., Tulsa, Okla. To get this interesting literature, prepared by anode specialists, just check the coupon.

Efficient Underdrains for Rapid Sand Filters

239. Be sure you have engineering data on vitrified clay underdrains, efficiently designed for filtering and backwashing. Check the coupon or write F. B. Leopold Co., Inc., Dept. PW, 2413 W. Carlson St., Pittsburgh 4, Pa.



Each length of pipe we manufacture passes through the above hydrostatic test press where it is filled with water and the pressure raised to 500 pounds per square inch. The most common water works pipe is designed for an operating pressure of 150 pounds per square inch. This undergoes the 500 pounds per square inch hydrostatic test and permanent records for each piece of pipe are kept on file for inspection by our customers at all times. You can be assured with Alabama's Super De Lavaud Cast Iron Pipe. In sizes of 3" to 24" in modern long lengths. Bell and Spigot, Mechanical Joint and Flanged Pipe.

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Comprehensive Data on Cast Iron B & S Pipe

114. Full specifications, including A.S.A. which give all dimensions of standard and alternate patterns of American Mono-Cast Centrifugal Bell and Spigot Pipe in 3" to 48" sizes, will be found in a comprehensive booklet furnished by the American Cast Iron Pipe Co., Birmingham 2, Ala. Check the coupon for your copy.

Vertical Turbine Pumps For Municipal Water Supply

121. Engineering data on vertical turbine pumps for deep or shallow well operation in capacities ranging from 50 to 10,000 gallons per minute, oil or water lubricated, are covered in a booklet issued by Worthington Corp., Vertical Turbine Division, Succasunna, N. J. Check the coupon today for this helpful information.

What You Should Know About Turbine Pumps

167. In a colorful bulletin titled "Water Where You Want It . . . When You Want It" the Johnston Pump Co., Bin "K", Pasadena 8, Calif., gives details on turbine pumps with semi-open or closed impellers; oil or water lubrication; and adaptations for any power source or combination thereof. Get your copy of Bulletin 1015 by checking the coupon.

Pipe Joint Essentials and Couplings for Every Job

168. Superior pipe joints are tight, flexible, simple, strong and economical. Dresser's handsome 34-page bulletin No. 513 shows how these essentials are met and provides layouts for curves, working pressures and a wealth of other data. Be sure to check this bulletin on the coupon. Dresser Mfg. Div., 59 Fisher Ave., Bradford, Pa.

Data on Builders Butterfly Valves

172. Information on the newly expanded line of tight-closing, rubber-seated butterfly valves made by Builders-Providence, Inc., 343

Harris Ave., Providence, R. I. is available in Bulletin 650-LI. General arrangement dimension prints and data on valve operators are included. Check the coupon for your copy.

Locate Mains, Services and Leaks Without Digging

186. An 8-page booklet tells how to use the Fisher "M-Scope" to locate buried pipes, cables, valves, manhole covers, conductive and non-conductive sewer pipes and septic tanks by electronic means. Dry battery operated. Only one man is needed for operation. Get data from Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif., by checking the coupon.

Couple Pumps and Where to Use Them

194. Turbine pumps, coupled to motors or gear drives, offer many arrangements to suit your pumping needs. Mechanical features, capacity curves and service applications are reviewed in Bulletin C of Layne & Bowler Pump Co., Box 6991, Los Angeles 22, Calif. Check the coupon for your copy.

Engineering Data on Tilting Disc Check Valves

196. The Chapman tilting disc check valve is designed to lift away from the body seat without sliding or wearing; closes without slamming. Operating principles, details of construction, dimensions, recommendations and engineering data are fully covered in 18-page Bulletin No. 30. Get your copy by checking the coupon or write to Chapman Valve Mfg. Co., Indian Orchard, Mass.

Precision Line Locator Speeds Maintenance Work

202. Accurate location of buried pipe and cable is made easy with the compact, all-purpose Wilkinson Line Locator, made by Wilkinson Products Co., 3987 Chevy Chase Dr., Pasadena 3, Calif. One-man instrument finds depth as well as location, saves "guesswork" excavations. Get latest data by checking the coupon.

Helpful Data On Pipe Tools

230. Toledo drop head ratchet threaders are light, compact, ideally suited for work in tight corners. Three models for $\frac{1}{4}$ " to $\frac{3}{4}$ "; $\frac{1}{2}$ " to $1\frac{1}{4}$ "; and $\frac{3}{8}$ " to 2" pipe all feature quick change of sizes. Get Catalog 12A53 from Toledo Pipe Threading Machine Co., Toledo, Ohio. Check the coupon.

Water Lines Under Pavements Easily Installed

247. With a Trojan pipe pusher and puller no resetting of grip is required, so the work goes twice as fast. Two models, for pipe up to 2" dia. Get full details by checking the coupon. Trojan Mfg. Co., 1114 Race Dr., Troy, Ohio.

Standard Specifications for C. I. Pipe and Fittings

278. Standard dimensions for cast iron water pipe and special castings are available in convenient booklets offered with the compliments of U. S. Pipe and Foundry Co., Birmingham 2, Ala. Get your copy by checking the coupon.

Instrumentation and Control Equipment For Water and Sewage Plants

298. Full engineering data on the instrumentation and control equipment needed in water works, sewage plants, pumping station and related installations are provided in the "Application Engineering Data" binder issued by the Foxboro Co., Foxboro, Mass. Every engineer and designer should have this valuable material on hand. Check the coupon if you can use this data.

Quick Review of Water Meters

316. A helpful condensed catalog which covers sizes and types of water meters for every kind of service is available from Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8, Pa. Each type is illustrated and fully described; specifications and prices are included. Get Bulletin W-800 by checking the coupon.



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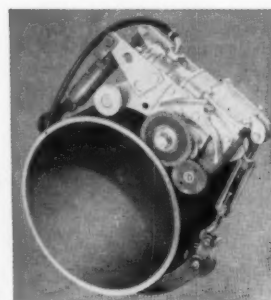


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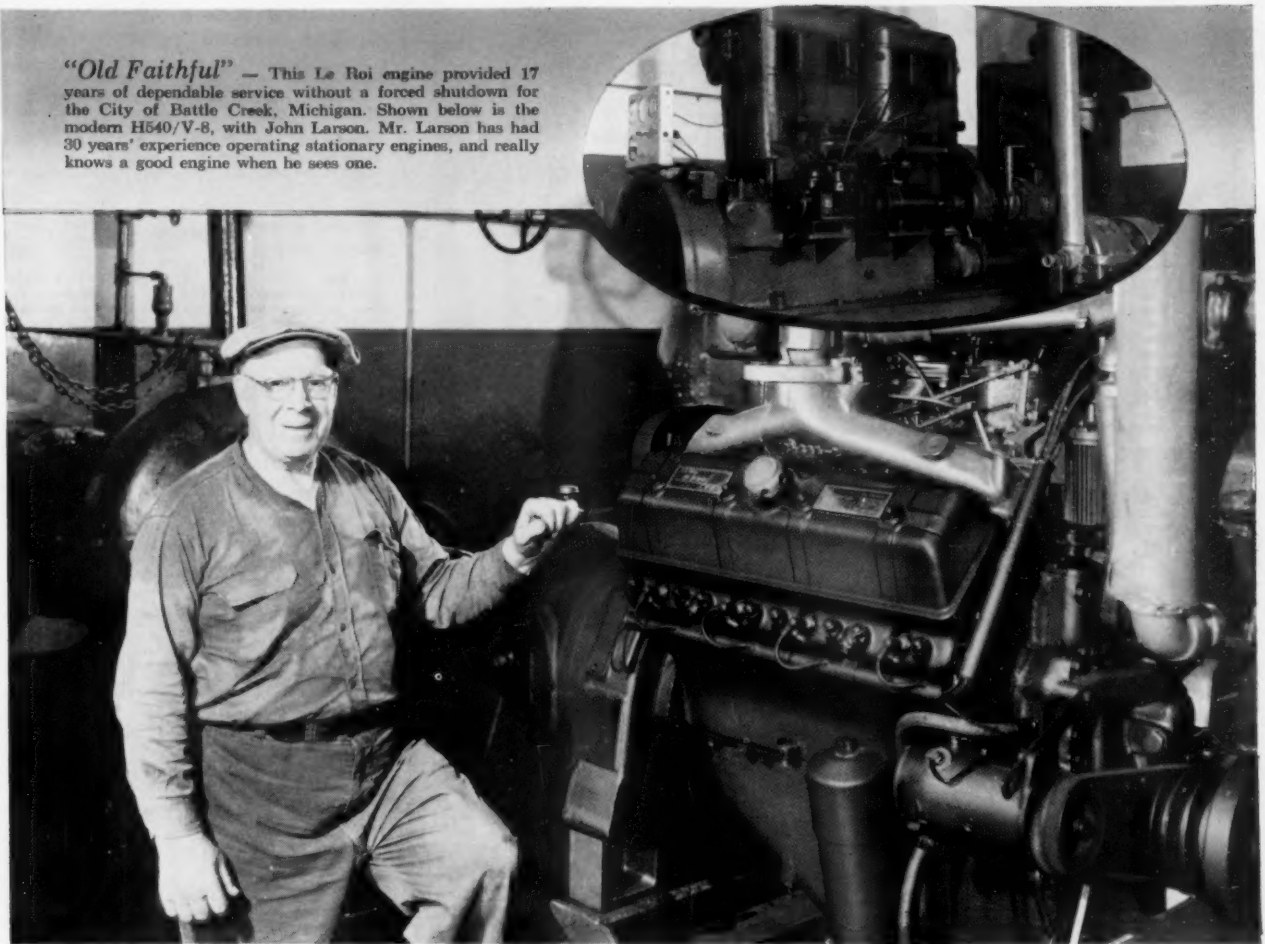
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the electric pumps were shorted out. The H540 ran up to 2100 rpm and, by so doing, carried the entire plant load for several days.

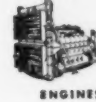
Performance during this emergency clearly indicated the advantages of the H540's short-stroke V-8 design. It proved that you get more horsepower per dollar and more horsepower per space. Other plus factors are easier servicing and easier installation.

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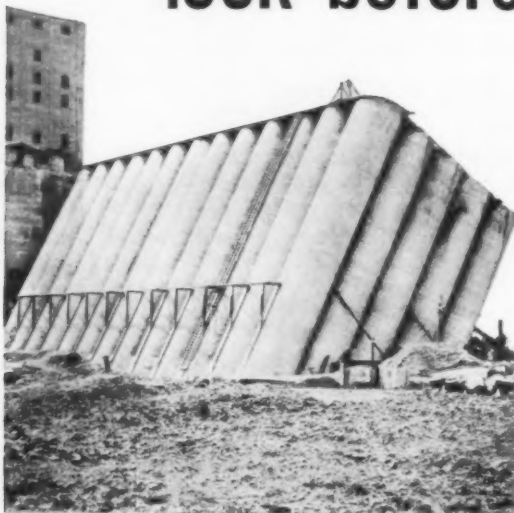
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Technical Bulletin on Solenoid Operated Valves

288. Full technical data on application, construction, dimensions and specifications of Golden-Anderson Cushioned solenoid operated valves is contained in Bulletin W-7, available from Golden-Anderson Valve Specialty Co., 1232 Ridge Ave., Pittsburgh, Pa. Selected valve patterns are offered in 1/2 to 2-in. and 2 1/4 to 36-in. sizes. Get all the details; just check the coupon.

Helpful Data on Water Meters

330. It is to the interest of every water works superintendent and engineer to have full data on dependable Badger water meters and related meter products. Complete data on all types of disc, turbine and compound meters, meter test equipment, yokes, strainers and alarm registers are supplied in an attractive binder by Badger Meter Mfg. Co., Milwaukee 45, Wis. Check the coupon for your copy.

Valuable Booklet on Porous Diffuser Plates and Tubes

341. A helpful 16-page booklet published by the Norton Co. is a complete guide for the selection of porous media for installation in rapid sand filters and activated sludge plants. Full data are provided for the consulting engineer. Maintenance of porous media is also discussed at some length. Get Form 140 from Norton Co., Worcester 6, Mass. by checking the coupon.

Diesel Engines For Municipal Power Needs

359. Dependable power for water supply or flood control pumping stations, stationary or portable electric plants and many other municipal needs can be provided by engines described in literature of the Enterprise Engine & Machinery Co., 18th & Florida Sts., San Francisco 10, Calif. Get latest data by checking the coupon.

All About Centrifugal Pumps

361. Where pumping performance counts you want to check your specifications carefully. Investigate the features of Fairbanks-Morse centrifugals. Use coupon or write to Fairbanks, Morse & Co., Dept. P. W., Chicago 5, Ill.

How Your Filter Washing Can Be Improved

368. More effective sand washing with elimination of mud balls and bed cracking with resultant longer filter runs are claimed for the Palmer Filter Bed Agitator, described in bulletins issued by Palmer Filter Equipment Co., Erie, Pa. Get latest data by checking the coupon.

Book Tells How to Control Algae

371. Details on the control of various microscopic organisms frequently found in water supplies are furnished in a 44-page booklet offered by Phelps Dodge Refining Co., 40 Wall St., New York 5, N. Y. Check the coupon for your copy.

Data On Efficient Mechanical Pipe Joints

396. "Bolite" standardized mechanical joint pipe lays fast, joints are quickly made, are flexible and durable. For full details on this equipment write McWane Cast Iron Pipe Co., Birmingham, Ala., or check the coupon.

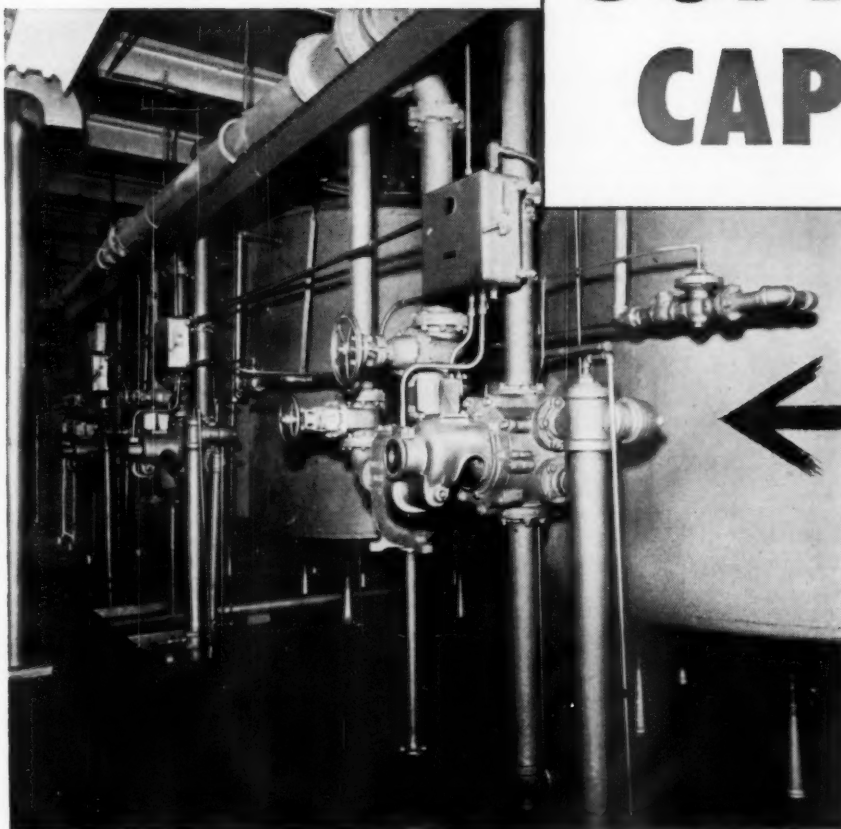
SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay underdrain blocks conforming to ASTM standards, suggestions for layout and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute, c/o Editor, Public Works, 310 E. 45th St., New York 17, N. Y. Check the coupon and we will forward your request.

To order these helpful booklets check the coupon on page 32.

How the Town of Normal, Illinois **TRIPLED SOFTENING CAPACITY**



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A Handbook of Sewer Cleaning Methods and Materials

44. Complete, easy-to-follow directions for every type of sewer cleaning operations and the equipment needed for effective cleaning work is covered in a 40-page booklet issued by Flexible Sales Corp., 3786 Durango, Los Angeles 34, Calif. Full details are provided on power cleaning machines, the SewerKoder, hand tools and all accessories. Water main and culvert cleaning methods are included. Check the coupon for your copy of this helpful handbook.

Maintenance Painting Systems for Sewage Treatment Plants

56. Recommended maintenance painting systems for sewage treatment plants, based on a detailed study of sewage plant painting problems, practices and experience, have been compiled by The Tropical Paint Co., Cleveland, 2, Ohio. Virtually all types of plant equipment are considered in some detail, and information is provided on both new work and repainting. Get this helpful report by checking the coupon.

Engineering Data on Screening Equipment

77. Water, Sewage and industrial waste screening equipment is fully described in a 28-page book, No. 2587, offered by Link-Belt Co., Dept. 137, Colmar, Pa. Complete data for the engineer and tables to determine the proper size unit for handling various capacities are included. This valuable, comprehensive booklet may be obtained by checking the coupon.

Theory of Controlled Digestion With Floating Cover Tanks

88. In an excellent 40-page booklet, an authoritative discussion of digestion theory and practices, including design, operation and economics is presented by the Pacific Flush Tank Co., Chicago 13, Ill. Complete data are given on the use of floating covers, together with details on tank construction, piping and control chambers. Requests for this valuable booklet must be made on business letterhead.

Non-Clogging Vertical Wet-Pit Pump Described

182. Full engineering data on Worthington "Freeflo" wet-pit pumps with non-clogging impellers capable of passing solids and stringy material are included in Bulletin W-317-B12. Check these pumps for sump, sewage and drainage service. Bulletin available from Worthington Corp., Harrison, N. J. Just use the coupon.

Complete Catalog for Engineers Shows Water and Sewage Plant Equipment

191. The complete line of Jeffrey equipment for treatment of water, sewage and industrial wastes is covered in 52-page Catalog 833-A. Detailed information is provided on bar screens, grinders, grit collectors, "Jigrit" washers, sludge collectors, feeders, conveyors and other related units. Photos and drawings of installations plus capacity tables complete this valuable booklet. Use coupon or write Jeffrey Mfg. Co., 947 N. 4th St., Columbus 16, Ohio.

Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy. Get yours by checking the coupon.

Helpful Data on Venturi Type Meters

221. The Simplex type MO Meter I for measurement of water, sewage, sludge and industrial liquor flows over wide ranges, is featured in an information-packed bulletin, No. 500, issued by Simplex Valve & Meter Co., 7 E. Orange St., Lancaster, Pa. Get this bulletin for data on operation, construction, accuracy, primary devices and other information of interest to engineers who deal with fluid flow problems. Check the coupon.

Chemicals Used in Water, Sewage and Waste Treatment

248. A 16-page technical bulletin No. 10-K12A offered by Omega Machine Co., 345 Harris Ave., Providence, R. I., compiles in convenient form full information on the chemicals, used in water, sewage and waste treatment. Data includes formulas, common names, commercial strengths, forms in which they may be obtained, sizes of shipping containers, and many other items, including recommendations for handling and feeding. Get this useful bulletin by checking the coupon.

Portable Bituminous Mixer Will Discharge into Trucks

264. The Tower Loader, available on either the 10 or 14 cu. ft. Kwix-Mix bituminous mixer, conveniently loads bituminous mix into trucks, overhead hoppers or stockpile. Be sure to investigate these labor saving mixers and the Tower Loader. Literature offered by Kwix-Mix Co., 3029 W. Concordia Ave., Milwaukee 16, Wis. Check the coupon.

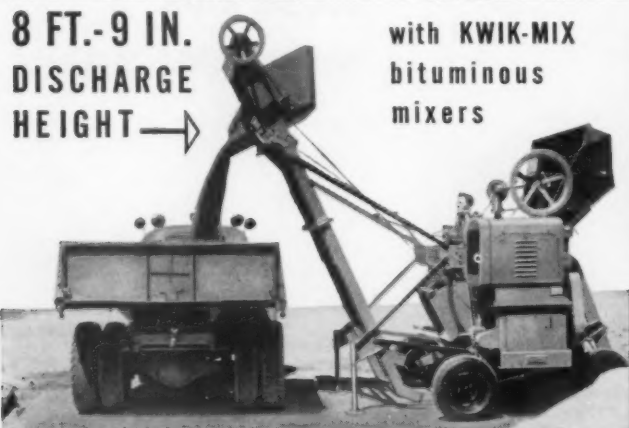
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"Float-Treat" Process For Industrial Wastes

333. The Rex "Float-Treat" process, a system used to separate greases, chemical flocs and suspended organic matter from industrial waste liquids, is the subject of a new booklet issued by Chain Belt Co., Milwaukee 1, Wis. Detailed description includes plan views, diagrams, photos and text. Get Bulletin 54-82 by checking the coupon.

Submersible Sewage Ejector Simplifies Installation

275. The Weil submersible non-clog sewage ejector is a compact unit with a completely sealed motor, available in several sizes with capacities up to 300 gpm. For details on unit selection, installation methods, construction features and controls get Bulletin SE-860A from Weil Pump Co., 1530 No. Fremont St., Chicago 22, Ill. Check the coupon.



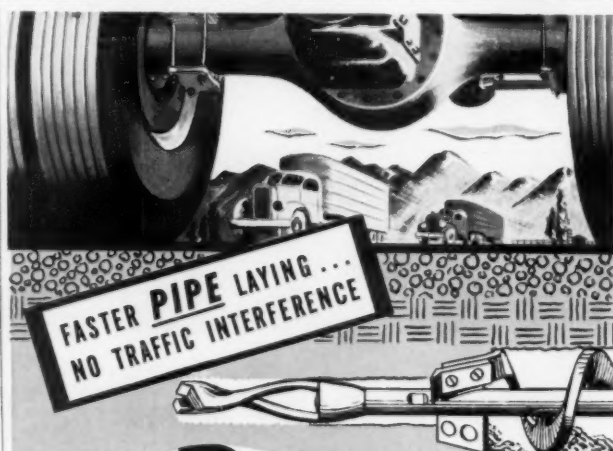
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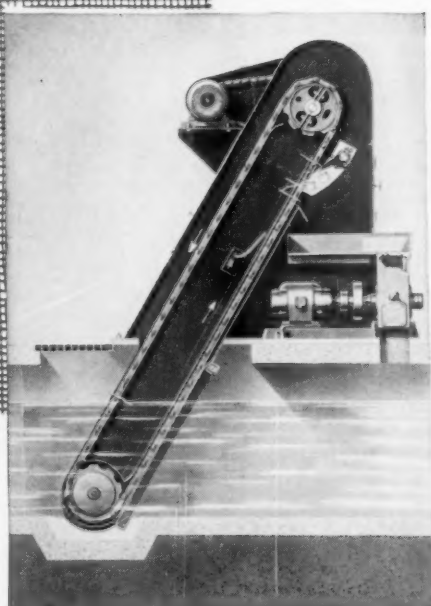
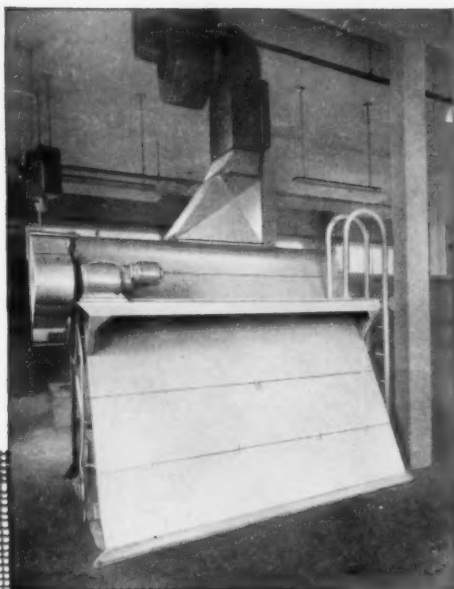
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Booklet Helps Design of Custom-Engineered Steel Buildings

110. Custom-engineered Butler steel buildings are available in every size, type and design to meet your building needs. In a helpful 32-page booklet you will find details on several basic designs and an unlimited variety of door, window and interior treatments; answers to your questions on construction and erection; and many illustrations of typical uses. Use the coupon or write to Butler Mfg. Co., Kansas City, Mo.

Helpful Booklet on Carryable Centrifugal Pumps

129. A booklet prepared to give practical information that will guide you in choosing the best type of pump for your requirements is offered by the Homelite Corp. Both gasoline and electric models are discussed, and requirements outlined for many applications. Just check the coupon for your copy. The Homelite Corp., 2125 Riverdale Ave., Port Chester, N. Y.

Now Every Municipality Can Own a Trencher

173. The low cost of the Blackhawk Trench Hog, a tractor-mounted ladder type trencher makes it profitable for many municipalities to own their own trencher. Be sure to investigate this versatile machine which digs trenches to 8 feet deep, 20 inches wide. Illustrated bulletin available from Arps Corp., New Holstein, Wis. Just check the coupon.

Choosing Trucks For Municipal Service

204. Trucks that are high in efficiency and economy are needed for all municipal services. Be sure to investigate latest models of White motor trucks, engineered for high performance under all conditions. Full details from White Motor Co., Cleveland 1, Ohio. Check the coupon today.

How Air Placement of Concrete Will Help on Your Jobs

215. There are hundreds of jobs that can be done easier and cheaper by air placement of concrete; reservoir, tank and pool linings, concrete maintenance of all sorts are just a few of the applications. Get full details on two models of the high speed, easily operated "Bondactor" from Air Placement Equipment Co., 1009 West 24th St., Kansas City 8, Mo. Check the coupon.

What You Should Know About Soil Sampling

255. Acker Soil Sampling Catalog No. 25 contains a complete and thorough collection of information about soil sampling in all types of sub-surface conditions. Modern sampling techniques are discussed together with recommendations as to tools and accessories. Write Acker Drill Co., Inc., Scranton, Pa., or check the coupon.

All-Purpose Tractor Introduced by Oliver

391. Be sure to get full information on the Oliver Super 55 tractor, a new model designed to do every kind of municipal job. Takes all equipment, front, rear or side mounted, has built-in hydraulic system. Available with gasoline or diesel power. To get all the facts write The Oliver Corp., 400 W. Madison St., Chicago 6, Ill., or check the coupon.

Automatic Cutter Saws Cast Iron Pipe

393. This portable automatic pipe saw, available with either pneumatic or electric drive, makes fast precision cuts in 8-in. to 60-in. cast iron or steel pipe. Features are light weight, minimum clearance required, easy operation even when submerged. Get details from Prescott Tool Co., Inc., Worcester, Mass., by checking the coupon.

Economical Scraper Handles Many Heavy Jobs

398. Among the many applications of the versatile Model D Tournapull are: grading and building roads; handling garbage disposal, and grading, leveling and terracing. For details on how its speed, power and ability to work either as a self-loading tool can help your production and lower your costs, write Le Tournau-Westinghouse Co., Peoria, Ill., or check the coupon.

Service Bodies to Suit Your Maintenance Needs

260. Service bodies, tailored to fit the needs of any municipal department and featuring many outstanding features of construction and design, are described in literature of Morrison Steel Products, Inc., 601 Amherst St., Buffalo 7, N. Y. The new line has models to fit all popular truck chassis; $\frac{1}{2}$ to 1 $\frac{1}{2}$ -ton; single or dual wheel. Be sure to check the 18 different compartment arrangements offered — there is one that is best for the convenience and efficiency of your maintenance crews. Use the handy coupon today.

How to Solve the Brush Disposal Problem

277. Fitchburg Chippers, engineered to solve the brush disposal problem, reduce troublesome brush and trimmings to tiny, easy-to-dispose-of chips. Several models are available to meet your needs. May be mounted on truck body or on trailer, tractor or jeep. Full details in interesting, profusely illustrated 16-page bulletin. Write Fitchburg Engineering Corp., Fitchburg, Mass., or check the coupon for your copy.

Advanced Tractor Design Gives Better Performance

399. For greater power, performance and economy, Ford Tractor offers 4-wheel stability, built-in hydraulic system and power take-off among the many new features. A complete booklet describes five models in two power series, showing the latest in advanced tractor design. For your copy check the coupon or write Tractor and Implement Division, Ford Motor Co., Birmingham, Mich.

WEED CONTROL

Weed Killing Case Histories

205. Weed and grass control lasts longer . . . costs less with Du Pont "Telvar" weed killers. Interesting folder published by Graceli Chemicals Dept., E. I. Du Pont de Nemours & Co., Inc., Wilmington 98, Del. Full color photographs demonstrate effective action; text shows application methods for best results. Check the coupon for your copy.

Powerful Mist Sprayer Controls Pests

241. Mist sprayers for shade tree and mosquito control, roadside weed control sprayers and a full line of pressure pumps, engine equipment and spray guns in assemblies for every spraying need are presented in an illustrated catalog by Hardie Mfg. Co., Hudson, Mich. Get 40-page Catalog No. PC 57 for data on all types of chemical spray and dust equipment. Check the coupon.

How to Simplify Your Weed Spraying Operations

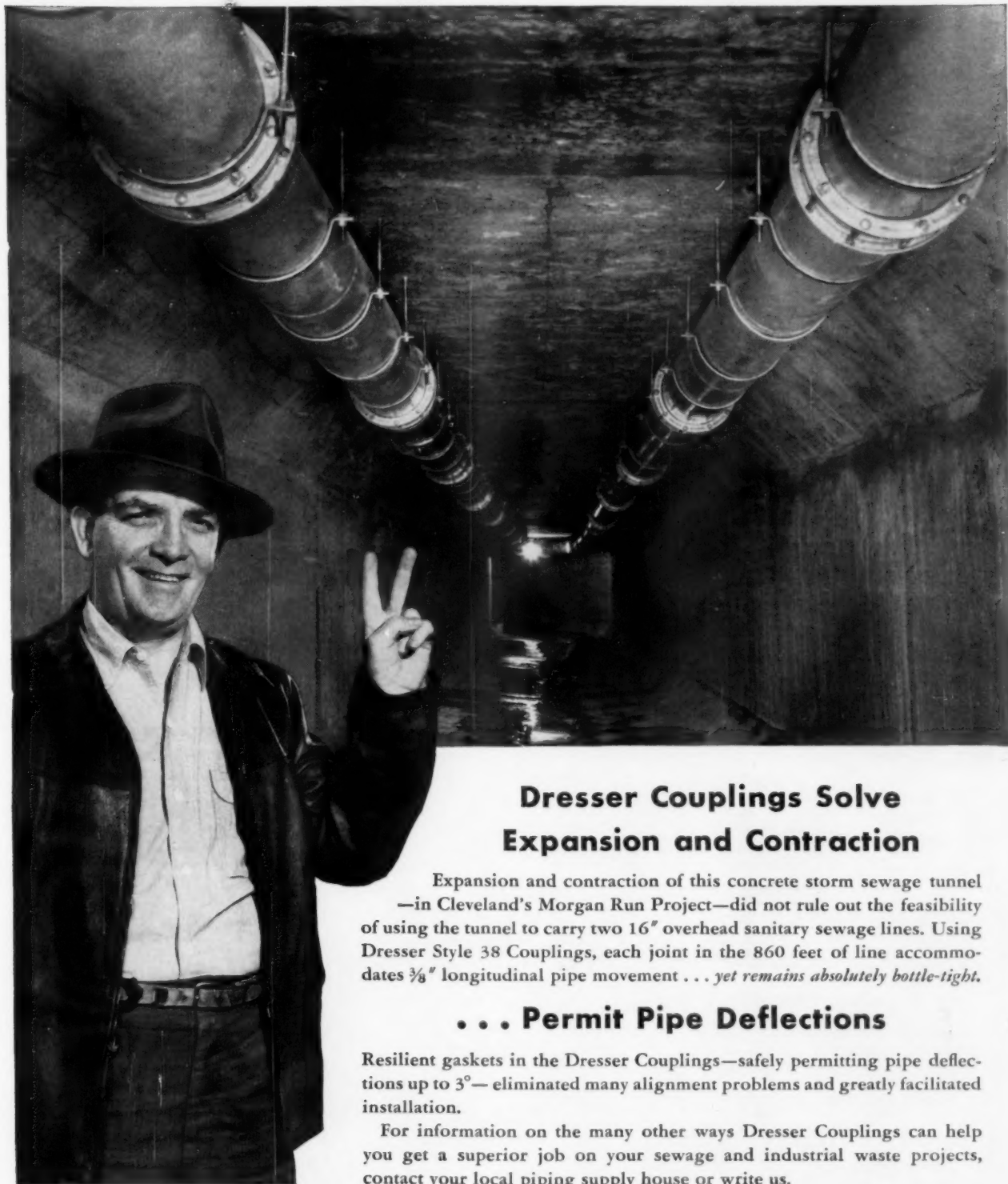
293. Chemical spraying for weed control is made simpler and easier by the Tarrant "Direct from the Drum" sprayer, a compact power spraying unit which will handle dozens of jobs. Get full data from Tarrant Mfg. Co., 27 Jumel St., Saratoga Springs, N. Y. Check the coupon.

SNOW AND ICE CONTROL

How to Skidproof Icy Streets

195. Specific facts on how to fight ice in winter are presented in the leaflet "Melt or Skidproof Icy Surfaces with Wyandotte Calcium Chloride". Write Wyandotte Chemicals Corp., Wyandotte, Mich. or check the coupon.

DOUBLE-TIGHT!



Dresser Couplings Solve Expansion and Contraction

Expansion and contraction of this concrete storm sewage tunnel—in Cleveland's Morgan Run Project—did not rule out the feasibility of using the tunnel to carry two 16" overhead sanitary sewage lines. Using Dresser Style 38 Couplings, each joint in the 860 feet of line accommodates $\frac{3}{8}$ " longitudinal pipe movement . . . yet remains absolutely bottle-tight.

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Dresser Manufacturing Division, 69 Fisher Ave., Bradford, Pa. (One of the Dresser Industries).
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DIETZ LANTERNS & TORCHES

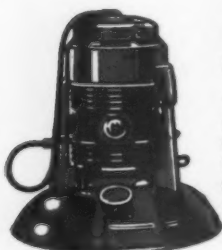
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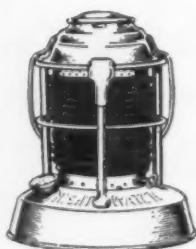
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Helpful Bulletins Give Sludge Pump Details

318. "Scru-Peller" sludge pumps for handling thick primary sludge, cutting up all solids as they pass through the pump, described with illustrations of details in a 20-page Bulletin 190B. Standard non-clog pumps are described in Bulletin 126E and 127D. Get them from Chicago Pump Co., Dept. J, 622 Diversey Pkwy, Chicago 14, Ill., by checking the coupon.

Engineering Data on Lubricated Plug Valves

355. Full information on Homestead lubricated plug valves in full-port and venturi types, sizes up to 14", and with a choice of self-seal two-piece plug or one-piece plug designs. Engineering information includes principal dimensions, types of control, metals, lubricants, etc. For your copy write Homestead Valve Mfg. Co., Coraopolis, Pa., or check the coupon.

STREETS AND HIGHWAYS

Tractor-Backhoe Combination Offers Big Returns

30. Features of the Allis-Chalmers Model WD-45 wheel tractor equipped with Henry backhoe and other Henry hydraulically operated attachments are outlined in an attractive 8-page catalog now available from the Tractor Division, Allis-Chalmers Mfg. Co., Milwaukee, Wis. In addition to specifications, the catalog includes illustrations of the basic unit and of various Henry front and rear mounted attachments plus details of the tractor itself. Get Catalog MS-982 by checking the coupon.

Helpful Installation Manual For Drainage Structures

62. A 46-page manual, well worth careful study by designers and field engineers dealing with drainage structures, culverts, sewers or conduits, is offered by Armco Drainage & Metal Products, Inc., Middletown, Ohio. Proper location of the structures, base preparation, assembly and backfill are some of the many items covered in detail. Use the handy coupon for free copy.

Examine a Tractor Piece by Piece

99. The 32-page catalog published by International Harvester Company should be studied by every tractor owner, for in it each unit from engine to track of the TD-2 Diesel is considered separately. These pieces by piece discussions are supplemented by notes on easy servicing, versatile applications and attachment for every need. Get your copy of form CH-313-A from International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill., or check the handy coupon.

Makes Underground Pipe Installation Easy

115. One-man operated hydraulic pipe pusher pushes pipe through ground under streets, sidewalks, lawns and other obstacles. Pays for itself in man hours saved on first few jobs. For complete facts ask for Form E-213, Greenlee Tool Co., Rockford, Ill. Just check the coupon.

Check List for Successful Earthmoving Bids

147. Valuable information for the earthmoving contractor and for the engineer who must estimate earthmoving costs is provided in a new two-color illustrated booklet issued by Caterpillar Tractor Co., Peoria, Ill. A convenient check list is included to help select the proper equipment for the job. Check the coupon to get Form No. DE502.

Black-Top Paver Offers Many Advantages

150. The flexible Adnurn Black Top Paver lays any asphalt mix, hot or cold, in widths from 6 ft. to 13 ft. Careful design lowers operating cost and cuts maintenance. Attachments spread stone, cinders or slag. Get full data on this machine by checking coupon. The Foote Co., 1954 State St., Nunda, N. Y.

Modern Lighting for Sports Events

133. Helpful engineering data on standardized "Sportslighting" are provided in a comprehensive 56-page manual issued by Westinghouse Electric Corp., Lighting Div., Cleveland, Ohio. Floodlight layouts and floodlighting equipment are shown for baseball, football and softball fields, tennis courts, golf driving ranges and many other outdoor and indoor sports activities. Application suggestions show how lights may be mounted and wired for best results. Get this authoritative booklet, No. B-5872, by checking the coupon.

What Should You Look For In a Power Sweeper?

206. Helpful information to aid you in the selection of a power sweeper to fit your needs is provided in Bulletin 85.2, issued by G. H. Tennant Co., 2530 N. Second St., Minneapolis 11, Minn. Full data on the highly maneuverable Tennant Model 75 Sweeper is included. Get your copy by checking the coupon.

Better Highways Through Salt-Soil Stabilization

162. Practical information for the men who build, repair and maintain our highways is provided in two bulletins issued by the International Salt Co., Inc., Scranton, Pa. General principles of salt-soil stabilization, applications, plant mix and road mix are described. Check the coupon for your copies.

Trenching Equipment Data Conveniently Assembled

212. The entire line of Cleveland trenching and backfilling equipment is now covered in a single bulletin, with material arranged for quick comparison of capacities, specifications and dimensions of all models. Twenty-four action photos graphically illustrates various job applications. Get Bulletin S-120 now for easy review of your trenching equipment needs. Just check the coupon or write to the Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio.

Patching and Maintenance With Bitumuls

283. Proper maintenance of paved surfaces is the subject of an informative 24-page booklet "Bitumuls for Maintenance" published by American Bitumuls & Asphalt Co., 200 Bush St., San Francisco 4, Calif. Profusely illustrated and well-written, this text gives step-by-step descriptions of patching and other surface maintenance operations. Check the coupon now to order your copy.

Heater-Planer Gives Low-Cost Surface Repairs

287. Low-cost resurfacing and repair work on bituminous pavements is made easy with the Littleford-Clarkmoore Heater-Planer. Machine operates continuously, heating and planing as it travels. Precise control leaves smooth riding surface. Get the details by writing to Littleford Bros., Inc., Cincinnati 2, Ohio, or check the coupon.

Hot or Cold Patching Mixtures Prepared on the Job

304. By preparing your patching mixtures, hot or cold, right on the job, you can use them immediately with a minimum of handling. Get full data on the McConaughay Model HTD "Multi-Pug" Asphalt Mixer for fast, easy and economical preparation of patch materials. Write K. E. McConaughay, Lafayette, Ind. or use the coupon.

Details on Motor Grader Construction and Use

312. In a handsome catalog, profusely illustrated with diagrams and photographs of unusually fine quality, the Galion Iron Works and Mfg. Co., Galion, Ohio, has presented all details on the construction and operating features of their Model 118 motor grader. This impressive 28-page catalog, No. 395, is available without charge. Just check the coupon.

Two-Way Radio Equipment For All Departments

363. The benefits of two-way radio communication in the uncongested non-interference 450-megacycle range make full information on this subject important to all engineers. Get full data on trouble-free systems from Motorola, Inc., Dept. PW, 4545 Augusta Blvd., Chicago 51, Ill. Just check the coupon.

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30% More Power to help you get jobs done on time. Ford's advanced "Red Tiger" engine powers the new 800 series Ford Tractors . . . delivers 42.5 belt and 35 drawbar horsepower.* Here's extra power to move more dirt, handle heavy work loads easier, do more jobs faster!

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Extra weight when you need it! Specially designed wheel weights, sold separately, let

you add easily and quickly more than 1150 pounds to the tractor, in addition to loaded tires. And, for special job conditions, you can add as much as 200 pounds to the tractor's front wheels for extra front end stability.

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*Manufacturers Rating



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EQUIPMENT DEALER



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REFUSE COLLECTION AND DISPOSAL

How New, Larger Load-Packer Cuts Refuse Collection Costs

51. Ever increasing problems in refuse collection work include longer hauls and higher costs of labor, chassis, operation and maintenance. As a solution, Gar Wood offers Load-Packers with dual-thrust compaction that gives big capacity on shorter wheelbase, plus safe, labor-saving operation. Profusely illustrated Form W-144 tells why you should investigate Load-Packers. Check coupon or write Gar Wood Industries, Inc., Wayne, Mich.

Increasing the Efficiency of Bulk Rubbish Collection

177. Strategically spotted bulk containers can be handled by one man operating a Dempster-Dumpster equipped truck. Get full details of this cost-saving system of rubbish collection, as used by many cities to increase efficiency and eliminate unsanitary conditions. Write Dempster Brothers, Inc., 952 Dempster Bldg., Knoxville 17, Tenn., or use the

CIVIL DEFENSE

Get the Facts on Air Raid Sirens

86. There's more to be considered in air raid warning sirens than the loudness of the signal. Get complete information on efficient size and spacing of sirens from Federal Sign and Signal Corp., 8733 So. State St., Chicago, Ill., by using coupon.

CONSTRUCTION EQUIPMENT AND MATERIALS

What's Your Digging Problem? Repair Work? Trenches? Footings?

35. At today's prices, hand digging means the job will be costly. You can dig through asphalt and macadam, work fast and efficiently even in cramped areas with the tractor mounted Sherman Power Digger. From one position you can reach to dig 14 feet behind tractor in 140° arc and dig to a depth of 10 feet. For full details check the coupon. Sherman Products, Inc., Royal Oak, Mich.

1,001 Profitable Uses For Holmes-Owen Loader

39. The addition of a Holmes-Owen Loader to your dump truck converts it into a complete digging and loading unit that enables one man to load, haul and dump. Illustrated folder shows how this self-loading unit with hydraulic crowding action can be a real time and labor saver for the municipality or contractor. Check the handy coupon for full data. Ernest Holmes Co., Chattanooga, Tenn.

8 Reasons Why You Should Check the Jaeger Loader

207. In a profusely illustrated 16-page catalog devoted to the applications and special design features of the Jaeger "Load-Plus" tractor-loader unit, eight good reasons listed to back up the claim that this machine out-produces any other loader of its size. These include load capacity, balance, reach, maneuverability, automatic power adjustment by torque converter, instant reversal, multiple speed and ease of control. Check them all by getting a copy of Catalog L100-3. Check the coupon today. Jaeger Machine Co., 400 Dublin Ave., Columbus 15, Ohio.

Safety Lantern With Pencil Beam Signal

70. Get information on the Dietz "Night Watch" Safety Lantern with special globe design that saves fuel by intensifying light rays into a pencil beam. Full details available from R. E. Dietz Co., Syracuse, N. Y. Just check the coupon for full data.

Useful Attachments for "Payloador" Tractor Shovels

95. Increased versatility for Hough "Payloador" tractor shovels is made possible by the various attachments described in literature of the Frank G. Hough Co., 761 Seventh St., Libertyville, Ill. Illustrated and described are rotary "V" and trip-blade show plows, hydraulic backhoe, back-filler blade, pickup sweeper, scarifier teeth, winches, etc. Check the coupon today and full details will be sent.

Grading Can Be Faster, Cheaper and Easier

96. You'll like every feature of the Austin-Western 99H Grader. It has all-wheel drive, all-wheel steer, controlled traction, precision sideshift and a high lift, extreme reach, reversible blade. Get data from Austin-Western Co., Aurora, Ill.

Auxiliary Equipment For Use with the "Jeep"

326. Be sure to investigate the versatile "Jeep" as a source of auxiliary power in combination with convenient transportation. Power take-off operates air compressors, generators, other equipment. For details write to Willys Motors, Inc., Toledo 1, Ohio, or check the coupon.

Restoration and Protection Of Concrete Structures

385. A "How to Do It" bulletin describing the Thoro System for repair and sealing interior and exterior masonry surfaces is available from Standard Dry Wall Products, Inc., New Eagle, Pa. The treatment for every water problem is presented in illustrated case histories in this useful publication. Check the coupon for your copy.



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Trojan Pipe Puller & Pusher installs or renews pipe under pavement *in half the time* required by any other machine!



MODEL A for
1/2" to 1" pipe



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PUSH PIPE fits
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**Exclusive continuous action,
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The Trojan combines pushing and pulling operations in one machine—keeps pipe continuously moving—lets you install 40' services in as little as 20 min.

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Prestressing is the biggest news in lighting standards for years. This exclusive feature of Hy-Lite Spun-Crete Standards assures much greater strength and durability.

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How the Mobil-Sweeper Can Improve Street Sweeping

305. Sweeping costs can be cut with the Mobil-Sweeper which features safe highway speeds up to 55 mph, carries 2 2/3 cu. yd. dirt hopper, sweeps swath up to 10' wide with full floating brooms. Hills and deep gutters are no obstacle. Write to the Conveyor Co., 3260 E. Slauson Ave., Los Angeles 58, Calif. or use coupon for complete details on this machine.

Versatile Road Wideners Improve Highways at Low Cost

374. In illustrated bulletins describing Apco road wideners and base pavers you will find full data on two versatile pieces of road-building equipment that will help you hold down costs while bringing old roads up to present day standards. Get the full story today by checking the coupon or write to Blaw-Knox Equipment Div., Blaw-Knox Co., Pittsburgh, 38, Pa.

STREET LIGHTING AND TRAFFIC CONTROL

Convenient Data on Traffic Signs and Markers

126. A complete line of traffic control devices, including stop signs, warning signs, regulatory signs and danger signals is presented in the fully-illustrated catalog of the Grote Mfg. Co., Bellevue, Ky. Helpful excerpts from the "Manual on Uniform Traffic Control Devices for Streets and Highways" are included. Get a copy by checking the coupon.

Helpful Data on Street Lighting Equipment

193. Complete data on Monotube street lighting standards together with information on brackets, mast arms and accessory attachments is available from Union Metal Mfg. Co., Canton 5, Ohio. Be sure you have the latest data on street and highway lighting equipment. Check the coupon now.

Safe-T-Cones Solve Traffic Problems Night and Day

222. For data on Safe-T-Cones, the all-rubber traffic guides available in two sizes, 18" and 28"—painted or reflectorized for day and nighttime use—get bulletin from Radiator Specialty Co., Charlotte, N. C. Information included on Safe-T-Signs which add greatly to value of markers. Check the coupon now!

Latest Data on Prestressed Concrete Lighting Standards

265. Comprehensive data on prestressed concrete standards for street and highway lighting is contained in a 24-page catalog which contains complete engineering tables and descriptive information on design features, mounting arrangements, base type choices and specifications of Hy-Lite standards. Get helpful and easy-to-read Catalog No. 300 by writing to American Concrete Corp., 5092 No. Kimberly Ave., Chicago 30, Ill., or check the coupon.

New Reflectorized Sign Faces Refurbish Old Traffic Signs

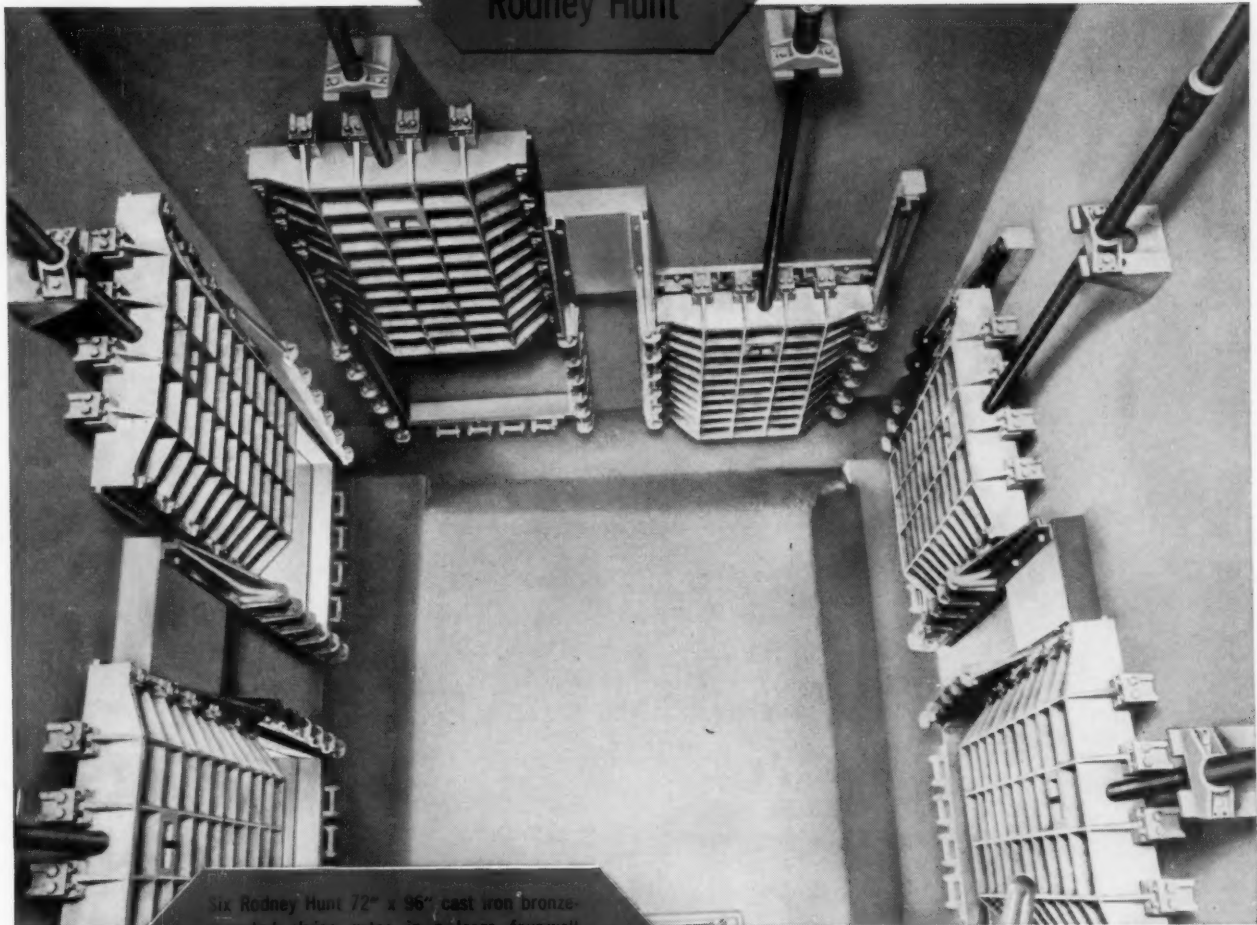
292. Get complete details on new "EZ-On" traffic signs faces ready for immediate shipments. Reflectorized faces cost only a fraction as much as new signs and are easily attached to existing traffic signs. Use the coupon for data today. Grace Sign & Mfg. Co., St. Louis 18, Mo.

Permanent Street Signs Cut Maintenance Costs

345. Permanent cast aluminum street signs and markers of all types are described in a 32-page illustrated manual available from Lake Shore Markers, 654 West 19th St., Erie, Pa. Get full information on these distinctive markers, available in plain or reflectorized finish. Check the coupon.

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Rodney Hunt



Six Rodney Hunt 72" x 96" cast iron bronze-mounted sluice gates in a large four-wall gate well chamber of a modern underground filtration plant. The two at left are inlets from the filter plant. Two in the middle act as inlet gates to the pH chamber. The two at right control the inlet passage to the main storage basin. All are built to withstand an unseating pressure exceeding 50 feet.

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Think how important it was on this huge project to be sure of proved design, dependable operation and long life, *always* engineered into Rodney Hunt equipment. In addition to units shown, other Rodney Hunt sluice gates as big as 8' x 8' clear opening were installed in this underground reservoir and filter plant built for one of our greatest cities.

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More than 2000 combinations of Sluice Gates and Hoists are described in our 232-page profusely illustrated catalog with valuable 23-page section on engineering data. Write *today* on your letterhead for Catalog WCA 952.

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Start a diesel engine in a mountain-top location such as this and it must keep running until spring. No failures. No maintenance.

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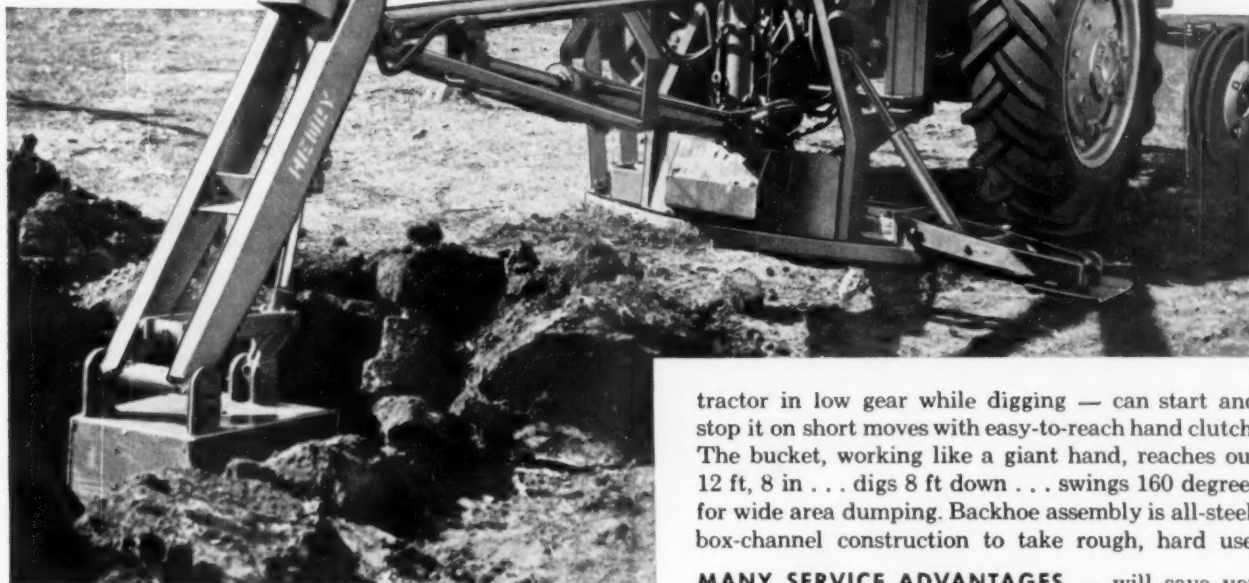
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WD-45 Wheel Tractor
with Henry Backhoe



Whether it's digging ditches, trenches, culverts, footings or foundations, you'll find this team's power, mobility and versatility ideal for use on any dirt-moving job. Check the features that make this machine a big performer at low cost:

PLENTY OF POWER — for big-scale production. The WD-45 engine with POWER-CRATER design develops over 45 belt horsepower . . . to give you more power per dollar . . . more work capacity than other tractors of this type. Thousands already in use have given the WD-45 nationwide fame as a performance leader.

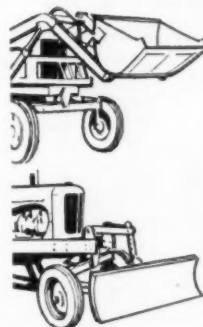
PLENTY OF WEIGHT — 5,325 lbs distributed right, give you the added traction and stability you need for tough, heavy digging and backfilling. It's a combination of a big, rugged wheel tractor and heavy-duty hoe to give years of continuous service.

MANY OPERATING FEATURES — let the operator do an efficient, thorough job in less time. With two-clutch control, the operator saves time because he can keep

tractor in low gear while digging — can start and stop it on short moves with easy-to-reach hand clutch. The bucket, working like a giant hand, reaches out 12 ft, 8 in . . . digs 8 ft down . . . swings 160 degrees for wide area dumping. Backhoe assembly is all-steel, box-channel construction to take rough, hard use.

MANY SERVICE ADVANTAGES — will save you money. Engine features like exhaust valve rotators, removable cylinder liners, pressure lubrication give long life and lasting performance. Backhoe features, like replaceable bushings on all wear points, provide easy maintenance.

PLENTY OF VERSATILITY — keeps the WD-45 with backhoe busy all the time. The unit is mobile enough to reach any job, especially the hard-to-get-to places. With power-shift rear wheels, the tread can be adjusted in less than five minutes when extra stability is needed. Choose from six interchangeable buckets, 16 to 24-inch widths. Front-end loader and backfill blade attachments are available as optional equipment.



See the world-famous WD-45 with Henry Backhoe at your Allis-Chalmers industrial dealer, or write direct to the company for literature.

ALLIS-CHALMERS

TRACTOR DIVISION — MILWAUKEE 1, U. S. A.

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.





**BEAT YOUR
MAINTENANCE
COSTS with GRACE**

**"EZ-ON"
TRAFFIC
SIGN
FACES**



IN THE NEW RED or YELLOW

GIVE SAME SERVICE AT
THE ORDINARY COST!

1/2



You save real money, about half... if you use 'EZ-ON' Faces that slip on right over your present signs. Same high quality and they're reflectorized. In quantities AS LOW AS...

\$2.80
EACH

**APPLIED TO SIGN ON LOCATION
SAVES REMOVING SIGN TO SHOP**

Now in the new RED (or Yellow as you may prefer), 'EZ-ON' Faces restore your old, defaced signs on location in less than 5 minutes! NO EXPENSIVE EQUIPMENT NECESSARY. Save time, save labor costs. Your maintenance problem is thereby solved!

**THEY FIT OVER PRESENT SIGN
ATTACH IN LESS THAN 5 MINUTES!**



1. Slip 'EZ-ON' Faces over old sign. Note wide flanges.



2. Then bend flanges backward holding 'EZ-ON' Face in place.



3. Use special Crimping tool to clamp flange and secure sign.

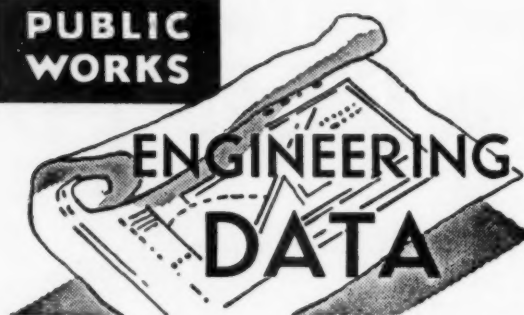
STANDARD COPY or YOUR OWN

They're made of 30 ga. steel and in 2 shapes and 2 sizes, as shown above. Any standard copy..warning or regulatory or your own copy... as you may prefer. 'EZ-ON' Faces are solving the maintenance problem in many states and cities throughout the nation. Why not in yours?

**SEND NOW DEPT. WP FOR SAMPLE SIGN
and SCALE of PRICES . . . and SAVE!**

**GRACE SIGN & MFG. CO.
3601 S. SECOND ST. • ST. LOUIS 18, MO.**

PUBLIC WORKS



Controlling Reflection Cracking

LEWIS W. CRUMP and ALEXANDER J. BONE

Massachusetts Institute of Technology

(Abstract of a Highway Research Board Paper)

Reflection cracking has become an increasingly important problem as the mileage of bituminous resurfacings over concrete pavements has grown. As yet no wholly satisfactory technique of crack control has been developed.

The methods proposed for controlling reflection cracking fall into two broad categories, prevention and sealing. Prevention involves eliminating the forces which cause cracking or modifying the resurfacing in the vicinity of joints to enable it to withstand these forces. None of the proposed methods of elimination is in general use, but many have been incorporated in test roads both in this country and abroad. Some have proved to be unworkable; others are being tested, but are still too new to provide definite conclusions. Several proposed techniques have yet to be tried or need further development before their worth can be determined.

The sealing of reflection cracks is difficult because of their narrow width and irregular shape. They require techniques and materials differing from those developed for sealing joints in cement concrete pavements. Surveys of technical literature, correspondence, and questionnaires to highway agencies reveal that current practices are far from satisfactory. Most treatments are not effective in keeping out water and dirt and preventing further deterioration. Some research on improved sealing techniques is underway, but much has yet to be learned and applied.

More research on reflection cracking is badly needed. It is a complex and fascinating problem that is a major concern to many maintenance officials.

Striping Wyoming Highways

More than 31,000 gallons of yellow paint were used to stripe 4,304 miles of Wyoming highways during 1953, an average of 7.37 gallons per mile. In addition, 15,000 pounds of beads were used to reflectorize more than 500 miles of highway. The order for reflector beads was doubled in the 1954 budget, so more than 1000 miles of State highway were treated with beads before the end of 1954. Approximately 4 pounds of beads are necessary for each gallon of paint to obtain the desired results, resulting in an additional striping cost of \$2.34 per mile.

In Wyoming, striping crews apply reflector beads after the paint is sprayed on the highway surface, before the paint is dry. This system provides instant night visibility, a distinct advantage over the other system of mixing paint and beads in the paint tanks.

HOLMES-OWEN TRUCK LOADERS

SAVING Thousands of Dollars

for MUNICIPAL Users.

LOWERS COST OF WINTER JOBS

The City of Lansing, Mich., makes excellent use of Truck Loaders during the snow and ice period to speed up work of clearing streets, removal of snow from intersections, bridges, etc., hauling of stock-pile materials and numerous other jobs that offer Big Savings to the city. Note unit loading salt for distribution during ice control.

LANSING, MICH.



Cuts JOB COST as much as 50%

Trucks equipped with Holmes-Owen Loaders are today reducing the cost of many jobs as much as 50% and offering users a savings amounting to thousands of dollars annually. The use of this equipment substantially lowers the cost of material handling. It assures faster, more efficient loading and hauling. Saves time, labor and equipment by permitting the truck driver to LOAD, HAUL and DUMP, do light digging, grading and cleaning-up without additional man power or the use of more costly equipment. The Holmes-Owen Loader can be installed on most 1½ to 2 ton trucks. It is hydraulically operated, lifts one-half yard per bucket, loads the average truck in four minutes and can easily do the work of several men. See your dealer or write factory today for literature and prices.

ERNEST HOLMES COMPANY
Chattanooga Tennessee

AMARILLO, TEX.



SAVES \$27,000 ANNUALLY . . . Two Truck Loaders in Amarillo, Texas reduced a street cleaning crew from 15 to 4 men . . . number of trucks needed from 5 to only 2. Mechanization of this work cut labor cost \$27,000 per year, released 3 trucks for other use.

CUTS COST ALMOST 50% . . . Extensive use of a fleet of self-loading trucks in Birmingham, Ala. reduced cost of maintenance on streets, parks and other public properties almost 50%. Mechanization of such work as spreading anti-skid material on icy streets, removal of dumpings from street sweepers, etc. offers additional savings in time, labor and equipment.

BIRMINGHAM, ALA.

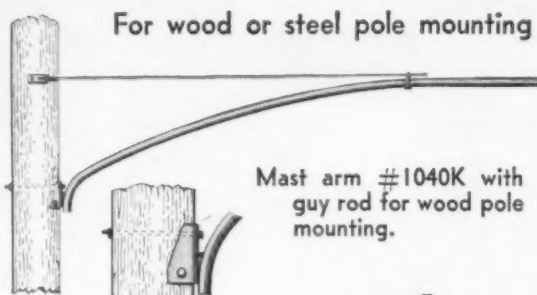


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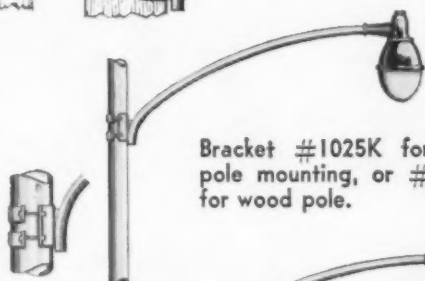
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For Economy & Beauty

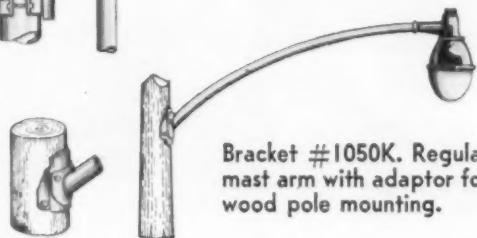


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Mast arm #1040K with
guy rod for wood pole
mounting.



Bracket #1025K for steel
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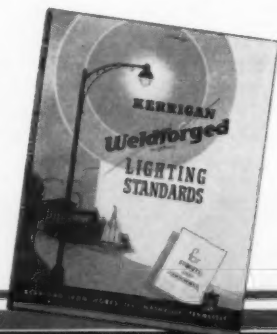


Bracket #1050K. Regular
mast arm with adaptor for
wood pole mounting.

Kerrigan's complete line of brackets and mast arms are carefully engineered for easy installation and wiring. They meet all I.E.S. street lighting recommendations. So, take advantage of your wood poles now in place and brighten up your city or town NOW!

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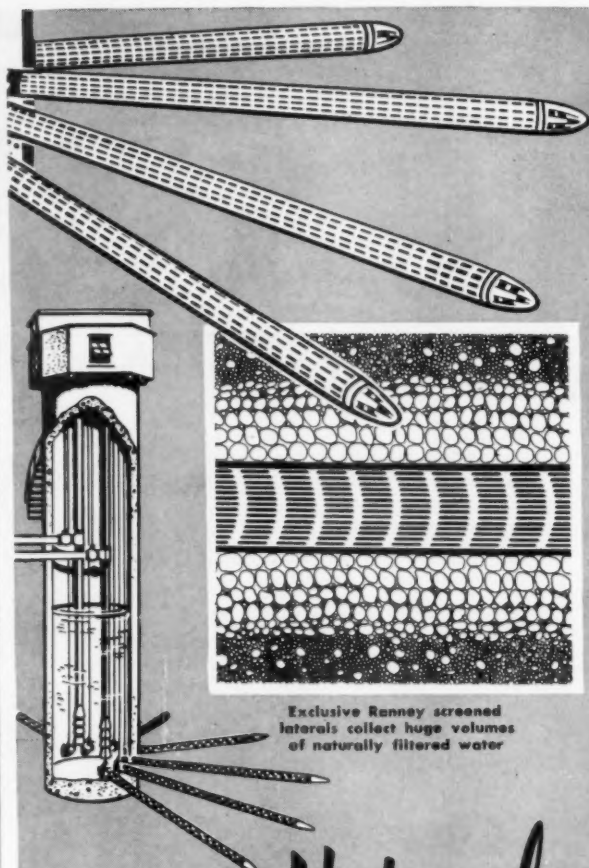
solve your city's lighting problems. Send for our FREE catalog containing engineering data. It shows how simple installation really is.



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The RANNEY METHOD, by Natural Filtration, produces water of better chemical quality than ground water . . . as proven by the many RANNEY installations now in operation. Each delivers millions of gallons per year of clear, non-turbid water at lowest cost. The RANNEY method reduces, or eliminates entirely, costly filter plants. If you need an efficient, economical water supply...

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HANDLING 11,000,000 GALLONS PER DAY, the new sewage plant at Salem, Oregon, has Worthington pumps for continuous, economical pumping power. John W. Cunningham & Associates, Portland, Oregon, were the Consulting Engineers for this project.

Salem's sewage system relies on these pumps

"... since the day our plant opened in 1952, Worthington pumps have been in daily operation — with never a breakdown. And because these pumps are the very life-line of our plant, their reliability has proved invaluable."

That's what Chief Operator Cliff Reed says about the eight Worthington centrifugal pumps at work in the new sewage disposal plant serving Salem, Oregon.

Mr. Reed isn't alone in his opinion about the rugged

Worthington units. We've had similar reports wherever Worthington pumps, comminutors or engines have been used — and that means water works and sewage plants all over the world.

Helping municipalities with their sewage and water works problems is our job today — has been for over 100 years. Write today for Bulletin W-317-B16 to Worthington Corporation, Public Works Division, Harrison, New Jersey.

W.4.11

"See the Worthington Corporation Exhibit in New York City. A lively, informative display of product developments for industry, business and the home. Park Avenue and 41st Street."

WORTHINGTON

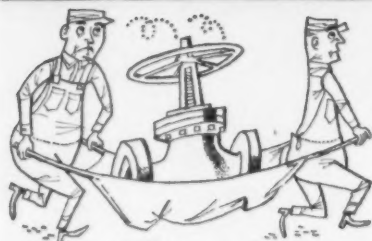


ALL MAJOR PUBLIC WORKS EQUIPMENT UNDER ONE RESPONSIBILITY

Water Works Pumps • Sewage Pumps • Comminutors • Vertical Turbine Pumps • Vacuum Pumps

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What's your GATE VALVE MORTALITY



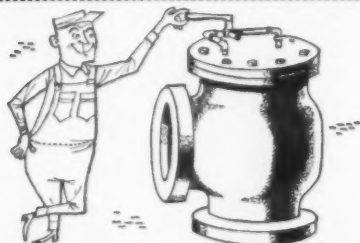
on installations requiring
frequent opening and closing?

REPLACE them
with **G-A**
FLOWTROL
VALVES

✓ Use the Angle Body and Save
the Price of an Elbow Fitting

✓ Built to Last a Lifetime

✓ Operates with Finger Pressure



HERE'S PROOF:

One of America's large railroads had a 6" gate valve installation that operated on the average of 55 times a day. In addition to frequent repairs, this valve had to be entirely replaced every 3 months.

In the Fall of 1947, this valve was replaced with a 6" G-A Flowtrol Valve. Now—more than 7 years later—this valve is still operating perfectly and not one parts replacement has been made!

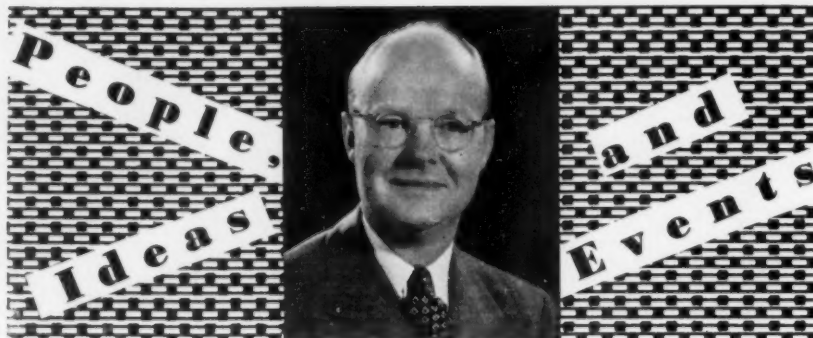
Want to know more about this unique valve? Write for Bulletin W-8A today.

**GOLDEN
ANDERSON**

Valve Specialty Company

1244 RIDGE AVE., PITTSBURGH 33, PA.

Designers and Manufacturers of
VALVES FOR AUTOMATION



by "Doc" Symons

H.T.M.A.—And here we are well into 1955 (are you still dating checks 1954?). Have you thought any more about the new World Calendar. Last month I said it could be adopted next year; I should have said it can be approved by the U. N. this year if the U. S. and Britain approve. Then, it will have 5 years for approval by all the countries and can go into operation on Jan. 1, 1961. Do your part—write Secretary Dulles and your Congressman.

★ ★ ★

Count Me In—When New York's new Governor, Averill Harriman, appointed John W. Johnson of Buffalo, N. Y. as Superintendent of Public Works for New York State, newspapers from all over the state applauded. Let me add my congratulations, too, to both of them—John and I worked closely together when we were associated with the Buffalo Sewer Authority; authored a couple of papers together, in fact.—Great guy, in my book.

★ ★ ★

About Florence—Had a card from T. F. McCarthy, Berkeley, California, who wrote — "Re your grind on Florence Jones and Sam Newkirk, in the January issue — since when did a Welshman named Jones obtain the right to the given name Florence? signed Thomas Florence McCarthy?"

And then there's Florence Driscoll, Water Register, Haverhill, Mass. They say, when he was asked how he got the name, he muttered something about a drunken uncle.—Wonder if it was the same uncle that Fred Allen had. Fred, the well known radio comedian, is really Florence Sullivan.

★ ★ ★

Did you know — That W. H. (Pete) Wisely, new Exec. Secy. of ASCE and former Exec. Secy. of FSIWA is the man who originated

"The Digester" published by the Illinois State Health Dept. "Pete" also originated the Illinois Sewage Operators Short Course in 1939 and it was he who created SOWHESS—"The Society of Operators Who Have Experienced Submergence in Sewage"—Pete says that means "full submergence" and he can't qualify.

★ ★ ★

Swedefinition — Girdle — The difference between facts and figures

★ ★ ★

Society of Council Bluffers — Our H-A. Member, Col. W. S. (Bill) Rockwell was the speaker at the N. Y. Section mid-winter luncheon in New York in January. Our Society was represented in the audience by Wendell LaDue, Dan Saunders, Attmore Griffin, Casey Jones, Reg Hayes and Doc Symons.

Among the "luminous quotes" from Bill Rockwell were these:

"We left 100 per cent more material in Europe at the end of World War II, than we used in the whole war."

"French manufacturers could increase production 25 percent, but they don't want to be unfair to their competition."

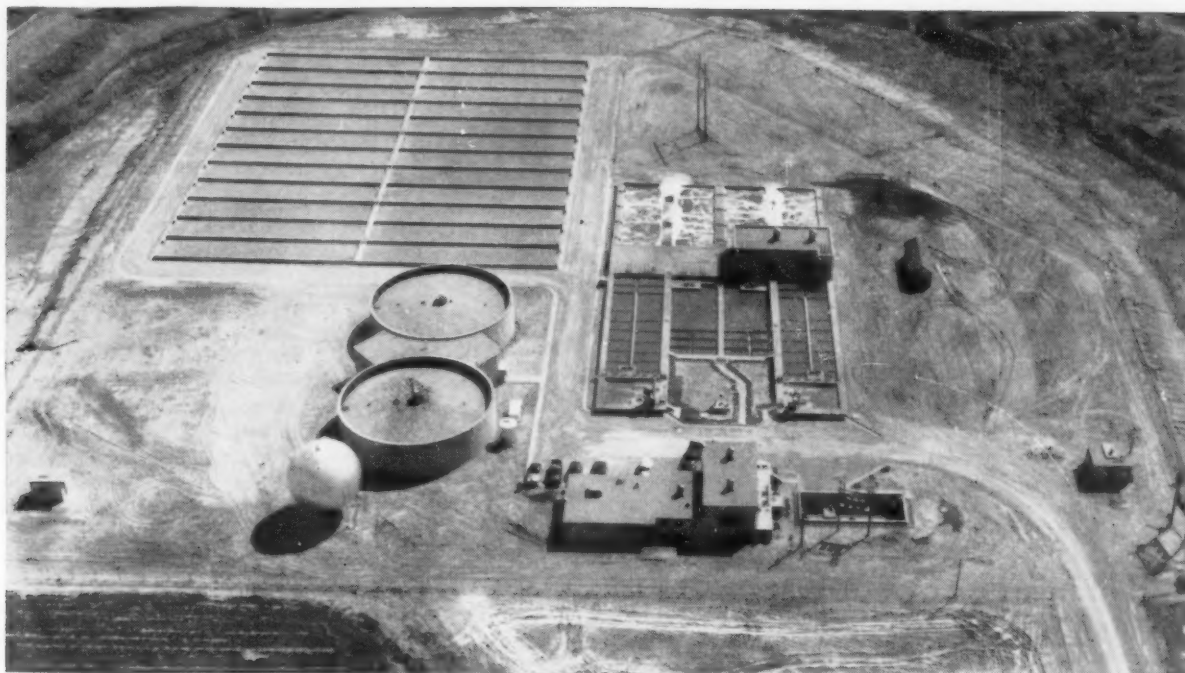
"Cartels are fine for everybody but the ultimate consumer."

★ ★ ★

It Was News to Me — E. Arthur Bell, Supt. of Water and Sewage in Essex Fells, N. J. is leaving to become Chief Engineer and Exec. Asst. to the President of the Stamford (Conn.) Water Co.—Somebody gains, somebody loses.—Glad to see Art so near Westchester County.

★ ★ ★

The Collector — Each year when the AWWA Board meets in New York City, the N. Y. Section AWWA is host to the Board members at the



At Enid, Oklahoma...

A plant is rebuilt for expandable treatment **WITH MODERN PFT EQUIPMENT**

A population growth of nearly 30% in the last 10 years (now 36,000), rendered Enid's 1928 sewage treatment plant obsolete. City leaders looked far ahead in approving plans for a vastly improved system—a plant designed to permit *doubling* its capacity with a minimum of cost and effort!

Assisting the engineers in meeting specific plant requirements, PFT supplied the following equipment for modern "controlled digestion."

Two *PFT Floating Covers* for the 70' digesters. The covers provide positive scum submergence for accelerated digestion and to safely utilize gas produced in the digester.

Two *PFT Cover Position Indicators* with low level alarms to allow checking of the liquid level in each digester from the operating floor of the control building.

Two *PFT Supernatant Selectors* (with Gauge, Sight Glass and Sampler units) for continuous withdrawal of the best digester liquor.

A *PFT Heater and Heat Exchanger* (750,000 B.T.U. per hr.) to keep digesters at optimum temperatures. Fired by sludge gas or natural gas, the unit saves fuel costs by utilizing all sludge gas produced, changing to natural gas only when necessary.

A *PFT Gravity Displacement Type Low Pressure Gas Holder* for compressor control.

In addition, PFT supplied many items of gas safety equipment: *Waste Gas Burner; Flame Traps; Pressure*

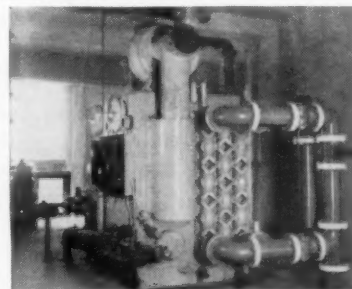
Relief with Waste Gas Flame Trap; Auxiliary Flame Cells; Accumulators; Drip Taps; Gas Pressure Gauge; Low Pressure Gas Check Valves.

PFT assures the successful operation of its equipment by checking each installation and instructing plant operators in the proper methods of using its equipment.

*Design of
plant by*

*Hudgins, Thompson & Ball
Associates, Oklahoma City,
Architect—Engineer;
Bernal H. Swab,
Sanitary Engineer*

**PFT
Heater
and heat
exchanger
unit**



P.F.T.

waste treatment equipment
exclusively since 1893

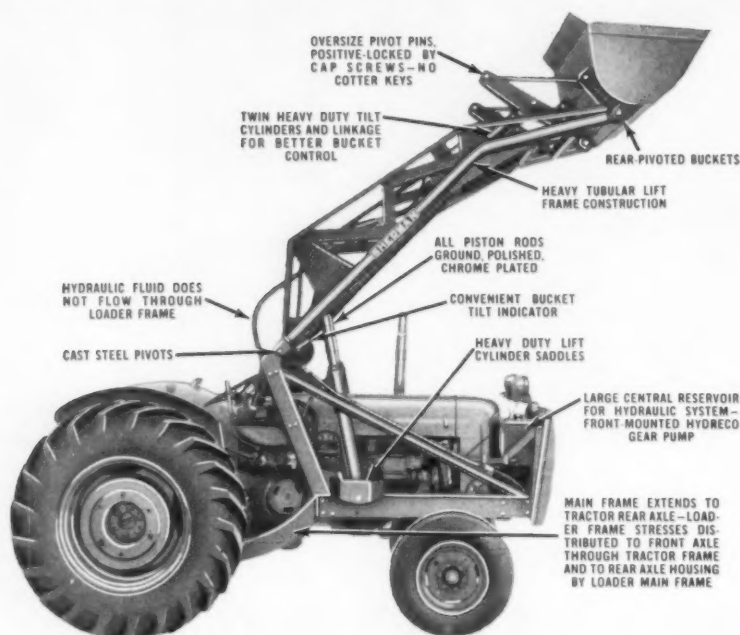
PACIFIC FLUSH TANK CO.

4241 Ravenswood Avenue
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PORT CHESTER, N. Y. • SAN MATEO, CALIF. • CHARLOTTE, N. C. • JACKSONVILLE • DENVER

Now's the time to mail this month's Reader's Service card.

New Sherman Front End Loader with Balanced Combination of REACH... HEIGHT... CAPACITY



Offers Many Exclusive Features

This new Sherman Front End Loader gives you *more for your money!* Loading height up to 10'10" . . . loads to front end of an 8' truck body from rear . . . bucket capacity up to 2500 pounds . . . breakaway capacity up to 4500 pounds . . . yes, these and other carefully engineered design features give you more than any comparable machine.

The husky main frame transmits loads to the tractor rear axle for greater traction and maximum performance with minimum strain on the tractor. Twin heavy duty tilt cylinders crowd bucket or attachments right in to do a man-sized job on excavating, loading, bulldozing, stripping, back-grading, bulk material handling, and many other jobs. Two models—up to 2500 lbs. payload.

The Sherman Front End Loader is economical, easily installed, safe and easy to operate . . . and sold by Ford Tractor dealers everywhere, your assurance of convenient, dependable service. Ask your dealer for an on-the-job demonstration—or write for Bulletin No. 511.



SHERMAN
FORK LIFT
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SHERMAN
POWER DIGGER
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SHERMAN
FRONT END LOADER*

*THE SHERMAN FRONT END LOADER IS MANUFACTURED EXCLUSIVELY FOR SHERMAN PRODUCTS, INC. BY JOHNSON HYDRAULIC EQUIPMENT CO., MINNEAPOLIS, MINN.

Get full details of this month's products . . . mail your Readers' Service card today.

annual mid-winter luncheon. During the course of Col. Rockwell's talk, I noticed John Pray of Iowa, emptying his coat pockets in which there had accumulated half a dozen spoons and a whole handful of sugar cubes. Sitting next to John was that Turbo-Encabulator Enthusiast, Carl N. Brown, Sales Mgr., Pipe, U. S. Pipe & Fdry.—Nuff Said ??? ?

★ ★ ★

Federation Gain — When FSIWA's Board of Directors appointed Dr. Ralph Fuhrman as Exec. Secy., to replace Pete Wisely, they didn't know how much they were getting. Few people know that Ralph is an expert clock repairman, along with all of his other attributes.

While the Wisely's have been in Scarsdale, N. Y. looking for a new home (they bought one a-building) Ralph has been staying in their Champaign house—and repairing all of their clocks, including the battery powered W & T electric clock—I've asked A. E. Griffin, many times, for one of those clocks, but no luck.—Maybe, Griff, you could find an old broken down one lying around the junk room and I could get Fuhrman to repair it.

★ ★ ★

Small World No. 28 — At the Annual Luncheon of the N. Y. Sew. & Ind. Wastes Assn. I sat down next to a man talking with Earl Deventorf, Director, Bur. of Envir. Sanit., N. Y. State Health Dept. Earl introduced him as Raymond Nee, Chief Engineer of Lederle Laboratories, Pearl River, N. Y.

Mr. Nee said, "I've read some of your articles and have wondered if you are the husband of Virginia Symons who is active in the Amer. Assn. of Univ. Women with my wife Terry.—Yep, that's my Va.—Then Mr. Nee asked about some of my work and I mentioned, B-I-F Industries of Providence and he said, "Are Ed Loud and George Kelsey still with Builders; I knew them when I was with Boston Edison."—Small World!!!

★ ★ ★

Swedefinition — "Sweater — A pleasant way of telling the difference between boys and girls."

★ ★ ★

In January, I sat in on two committee meetings in New York. One, on the program for the Federation Meeting in Atlantic City in October, the other, on local arrange-

ments for that Atlantic City meeting.—Take an advance tip, that meeting is one you should plan now, to attend. Write the Ambassador Hotel for reservations for Oct. 9-13.

★ ★ ★

News Notes from Brushy Bend—Friday, Jan. 21 was a busy day for Bob Shaw, Chief Engr. of New Jersey's State Health Dept. Morning, attendance at NYSIWA Meeting; afternoon, Local Arrangements Committee meeting for Atlantic City Federation meeting; evening guest speaker at the North Jersey Water Conference dinner meeting in Paterson, N. J.

Jan. 26—Northwest Ohio Section AWWA at Delta, Ohio had a tour of the water plant and Pet Milk Co., followed by cocktails, dinner (steak—\$2.50) and Business and Panel Type meeting.

Jan. 31—Long Island Water Conference at Felices in Westbury, L. I.

Mar. 18—NJSIWA is holding a special one day meeting at the Stacy Trent Hotel in Trenton, N. J. Since the Federation meets in Atlantic City this year, the usual March meeting of NJSIWA is being omitted.

V.T.Y.—Doc Symons

• • •

Fourth Louisiana Water Symposium

The Fourth annual Water Symposium and the Ninth annual Industry-Faculty Conference will be held at Louisiana State University Engineering Experiment Station. The Water Symposium will be held March 22 and 23; the Industry-Faculty Conference on March 31 and April 1. Frank T. Carroll, Jr., is acting Assistant Director of the Engineering Experiment Station and his address is Baton Rouge 3, La.

Florida Public Health Engineering Conference

The 8th Municipal and Public Health Engineering Conference of the University of Florida will be held in Gainesville, Fla., in cooperation with the Department of Agricultural Engineering, the State Board of Health, The Bureau of Water Research and the Department of Civil Engineering. The meeting, sponsored primarily by the Florida Engineering and Industrial Experiment Station, will be held March 15 and 16. The overall subject of the conference is "Water Management in Florida." Conference Chairman is David B. Smith of the Experiment Station.



How a Sherman Power Digger Does More Work in Less Time with No Standby Equipment

Nearly every department in the city of Hopkins, Minnesota, finds a use for this versatile Sherman Power Digger.

The Water Department uses the machine when cutting off discontinued service lines at the main. They dig a hole in the street (usually blacktop) 3' wide by 6' long by 8' deep. The hole must be plumbwalled for minimum replacement of paving. This operation used to tie up a truck all day, an air compressor half a day, and two men with hand tools, a full day.

Using a Sherman Power Digger, they now do *three* such jobs in one day, with only one man on the digger, no truck, and no compressor, except for concrete pavement. The job goes faster because they can dig the hole, shut off the line, and backfill before the walls begin to cave. Local soil conditions formerly required cribbing many of these excavations.

If *your* work involves the construction or maintenance of underground facilities, you will profit with a Sherman Power Digger. It's compact, fast, and flexible, with low initial cost and amazing economy of operation. Write today for full details, without obligation. Ask for Bulletin No. 512.

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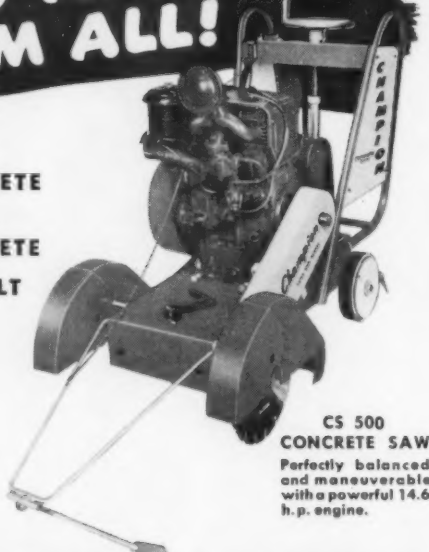


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CONCRETE SAW**
Perfectly balanced
and maneuverable
with a powerful 14.6
h. p. engine.

EASIER-FASTER-CHEAPER!

Champion

CONCRETE SAWS

This rugged, yet compact Champion harnesses 14.6 horses to get clean, straight bites in asphalt, green and cured concrete. Champion's compact and perfectly balanced design produces speedy cuts, saves important on-the-job time and labor costs, maneuvers easily in confined areas...cuts right into closest corners with Champion's "either-side" blade arrangement. Ask your distributor about the Champion or write direct. Champion's labor and money-saving features are worth checking into!

Sidewalk Patching with a Champion. Even well-cured, dense concrete like this is zipped through faster — and for less — by a Champion.

- Powerful 14.6 h. p. Gasoline Engine.
- Non-Sway Ball-Bearing Solid Rubber Wheels.
- Positive Screw Feed with Adjustable Positive Depth Stop.
- Dual Purpose Blade Guard for Either-Side Cutting.

BUY
Champion
BLADES FOR
ALL CUTTING



Champion

MFG. CO.

2028 WASHINGTON AVE., ST. LOUIS 3, MO., U.S.A.

BLACKHAWK

TRENCH HOG

VERSATILE
ACCURATE
FAST
LOW COST



**Ideal trencher for
scores of jobs:**

**FOUNDATIONS
SERVICE LINES
DRAINAGE
IRRIGATION**



Here's the handiest machine you ever owned — a fast, low priced, mobile tractor-mounted trencher for utility lines, foundations, sewer systems, septic tanks, etc. You'll find this ladder-type trencher working all the time. Cuts 6" to 20" wide trench down to a depth of 7'. Average digging speed 350' to 400' per hour — digs up to 800' per hour. Cuts through all soils the year 'round. Special chisel type cutters for rocky or frozen ground. Independent control of each drive wheel assures exact and easy regulation for either straight or curved trenches. Mounts on Ford or Ferguson tractor — easily driven from job to job — one man operated. Bulldozer blade available for backfilling. Write for all the facts today.

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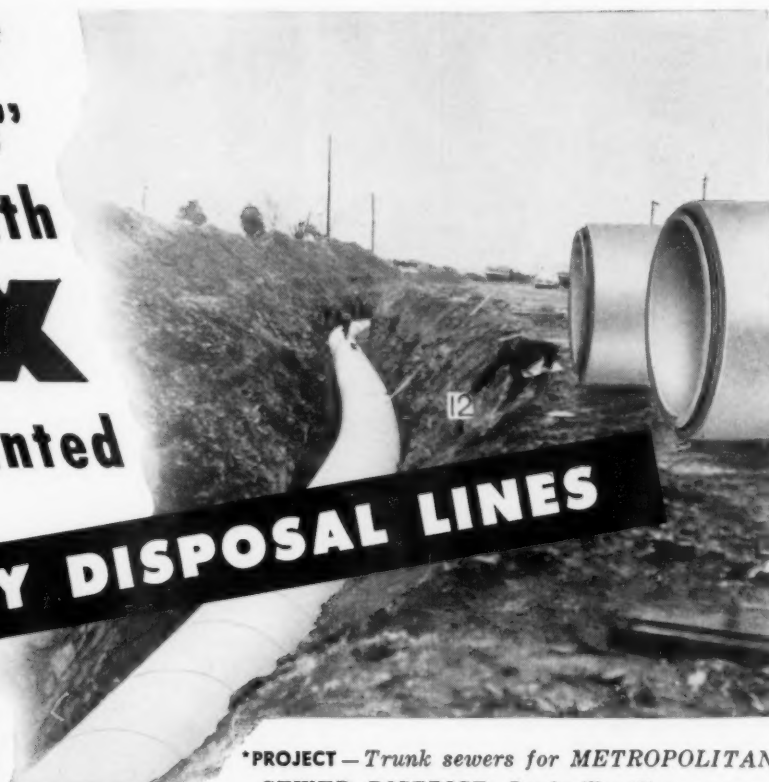
Dept. PW

NEW HOLSTEIN, WIS.

PRODUCTS FOR BETTER FARMS, BETTER INDUSTRIES SINCE 1920

Louisville* "Plays Safe" with **TYLOX** Jointed

SANITARY DISPOSAL LINES



***PROJECT**—Trunk sewers for METROPOLITAN SEWER DISTRICT, Louisville, Ky.

When engineers and sanitary officials of the Louisville and Jefferson County Metropolitan Sewer District specified TYLOX RUBBER JOINTS for new trunk sewers, they "played safe" on three factors that mean a lot in protecting public funds invested in waste disposal projects. Their TYLOX decision automatically assured:—

ENGINEER—Morris Forman, Chief Engineer

PIPE—Over 31,000 feet of 60" and 70" reinforced concrete pipe manufactured by Kentucky Concrete Pipe Company, Frankfort, Ky.

CONTRACTORS—Ruby Construction Company, Inc., and W. L. Hailey and Company, Inc., Louisville, Ky.


No Infiltration—Passage of water in or out of the pipe joint is prevented by "compression-tight" Tylox Rubber Gaskets. Tylox Joints help reduce costs of sewage treatment.

No Joint Failures—The rubber of Tylox is specifically compounded to defeat sewerage and industrial waste corrosives. Under ground, and under compression, Tylox outlasts the pipe itself. Tylox helps reduce maintenance costs.


No Installation Delays—Flexible Tylox compensates for pipe angularities in any plane . . . permits wet-trench jointing and immediate backfilling. Tylox helps cut construction costs . . . keeps jobs ahead of schedule with more pipe laid per day.

TYLOX is the one Pipe Joint which fully meets requirements of engineers, sanitary officials and construction men alike.

MAKING JOINTS WITH TYLOX RUBBER GASKETS IS AS SIMPLE AS

A 
Cement tongue and snap on TYLOX gasket.

B 
Lubricate sliding surfaces with TYLOX cement.

C 
Shove the pipe home to line and grade.

Specify TYLOX RUBBER JOINTS and play safe on your next pipe job. Write for full information and more TYLOX case histories TODAY.

**HAMILTON KENT
MANUFACTURING COMPANY**

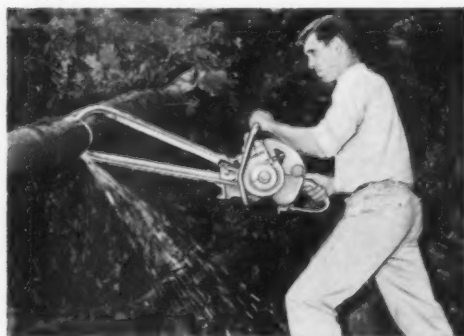
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5000



Bucks logs right on the ground. Fast. Quick. Clean. Jaw-grip spike bites into dirt . . . keeps chain up out of dirt. Spike takes thrust of chain . . . prevents logs from rolling or spinning away.

Plunge-bucking speeds clearing operations. Gets into all kinds of hard-to-reach places. Enables operator to work quickly, but safely, in close quarters and on steep slopes.



NEW CLEARING ATTACHMENT FOR HOMELITE CHAIN SAWS

Here is a completely new Homelite development that makes a Homelite One Man Chain Saw an even greater time-and-money-saver. Converts the Model 17 Chain Saw into an *all-purpose clearing tool* . . . quickly, easily.

With this highly maneuverable new attachment . . . driven by the 3.5 h.p. engine of the 22 pound Homelite Model 17 . . . one man can do the work of

a whole gang of men using saws and axes. He can fell, buck, and limb all small trees and saplings without bending, stooping or chain binding.

On demonstration after demonstration, men who have used this clearing tool agree that here is positively the best thing yet.

Write for a free demonstration.

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Carryable Pumps • Generators
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Canadian Distributors: Terry Machinery Co., Ltd., Toronto, Montreal, Vancouver, Ottawa.

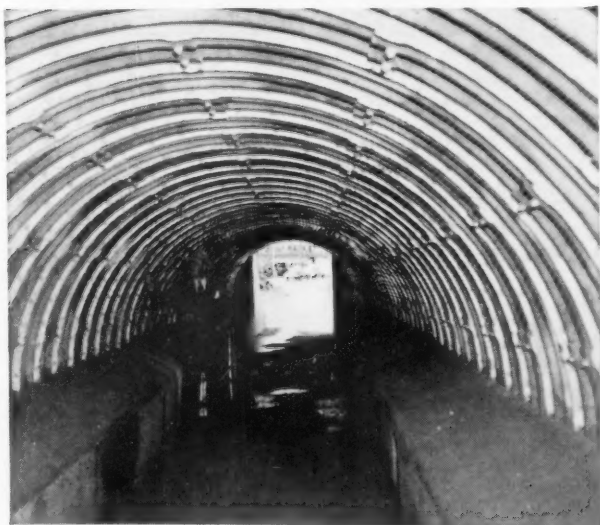
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Armco Liner Plate replaces failing segmental tile sewer in Indiana.



Armco Liner Plate used in railroad underpass in California.



This is an individual Armco Liner Plate. Bolting several together produces a strong metal ring. And bolting successive rings together makes an integral tunnel conduit. These structures have many important advantages in municipal applications.

NO SURFACE DISTURBANCE. Using Armco Liner Plates means that there will be no open trenches to tie up traffic on busy streets; no tearing up of expensive surface installations; no inconvenience or loss of business by merchants; no safety hazard for workers, autos or pedestrians.

MORE ECONOMICAL. Underground structures are often installed by open cut. But if this means destroying and replacing costly pavements; extensive earth removal for a deep cut; or seriously hampering movement of traffic—tunneling with Armco Plates is probably your *most economical choice*.

GREATER STRENGTH. With Armco Liner Plates, corrugations are continuous through the longitudinal lapped joints for greater ring strength. On a pound-for-pound basis, Armco Plates are the *strongest made*.

Armco Liner Plate structures can be round, elliptical, or almost any curvature of arch. Wide size range. Write for more data, Armco Drainage & Metal Products, Inc., 4705 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

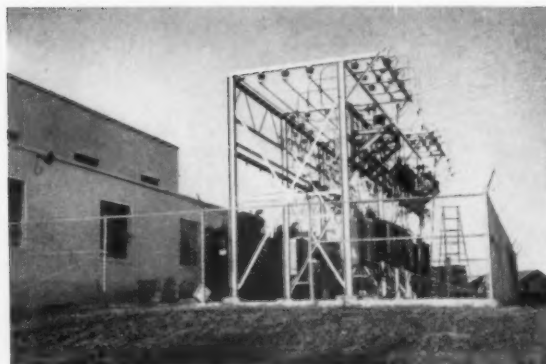
ARMCO LINER PLATE



Armco Liner Plates installed as storm sewer in Alberta, Canada.



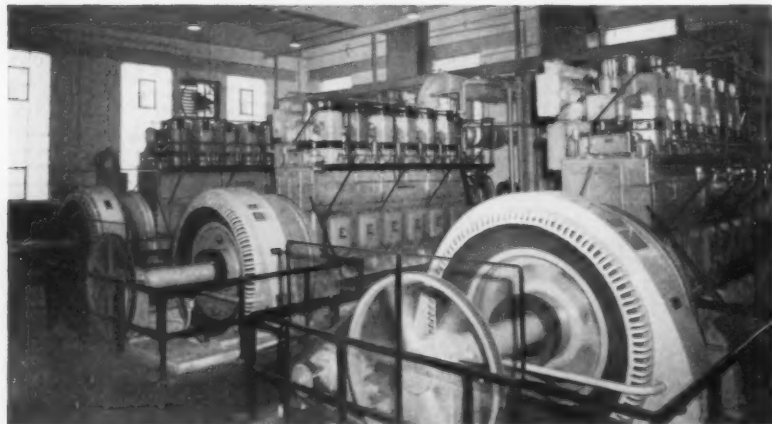
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2500 KW Enterprise-powered REA Co-op serves homes, business, industry and agriculture in broad area up to 450 miles distant. New plant has never had a power failure.

Two Enterprise Model DSQ-36 Diesels, each rated 1200 HP at 327 RPM, were installed in 1948, followed by third in 1952. Economical operation has reflected in reduced KW cost.

REA Co-op proves Enterprise dependability —no power failures here!

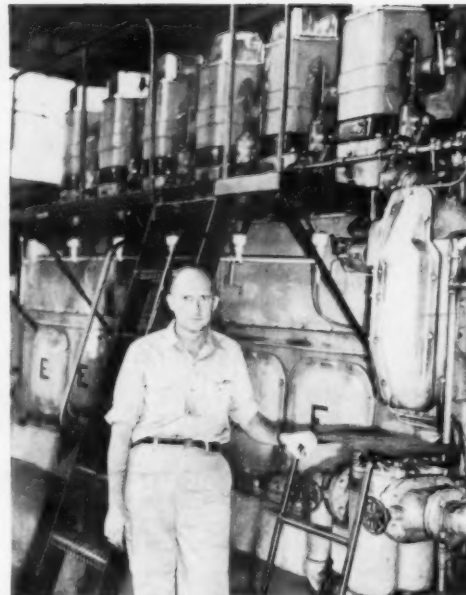


Since 1948 not one of the Turbocharged Enterprise Engines has been shut down for more than two hours for minor repairs or adjustment—even when operating at peak load of at least 20 out of 24 hours, six months at a time.

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W. B. Irby, Jr., the Glades manager says: "Our excellent operating record speaks for itself, and certainly speaks well for both my Superintendent, Mr. Keenan, and Enterprise Engine & Machinery Co. If we have our choice, we will never have anything in our plant but an Enterprise."

Over a million horsepower at work the world over!

ENTERPRISE dependable ENGINES

THE SWITCH IS TO ENTERPRISE
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- ★ Ready to dig on arrival.
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Let us show you how the new B-G 711 Ditcher can reduce your costs.

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POWER BUCKET MACHINES

We find cities wasting 1,000 gallons of water a day trying to open a single line with old-fashioned methods. Often they just push the stoppage around.

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Saving water may or may not be a problem with your city—but we have many other advantages in "Flexibles" we'd like to tell you about.



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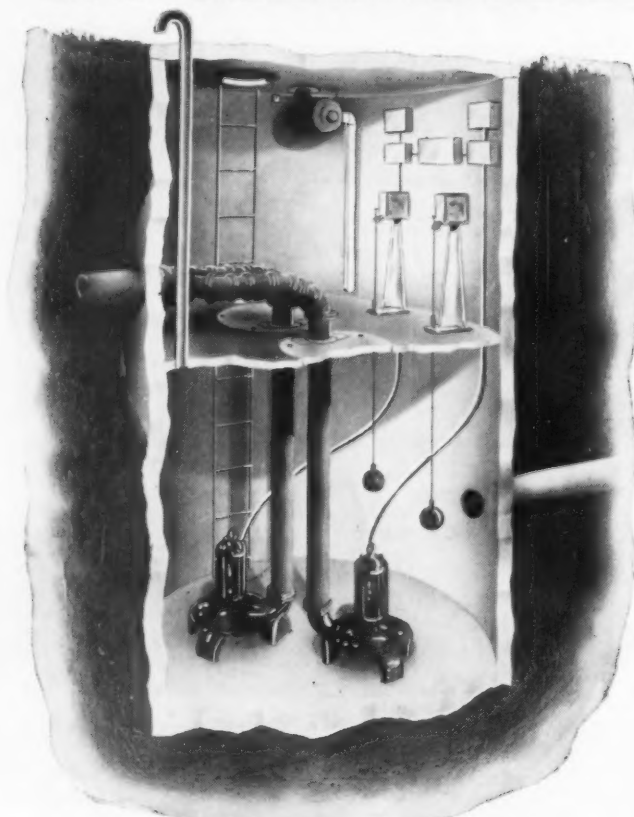


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The **weil** NON-CLOG Screenless Submersible Sewage Pump with the **BLADELESS** impeller will pump ALL sewage and drainage water — household sewage, industrial sewage and waste — even rags.

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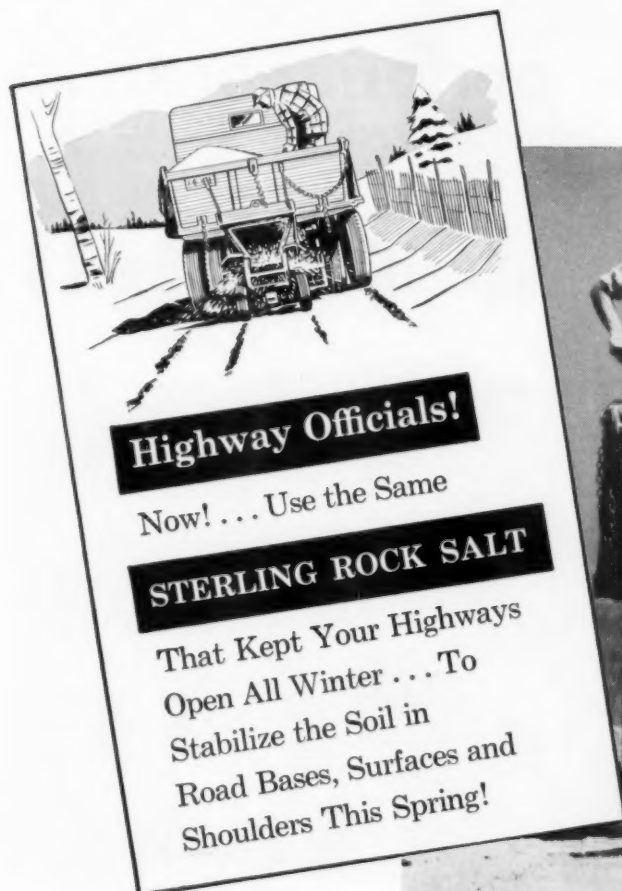
Illustration shows economical installation which DOES NOT REQUIRE A PUMP HOUSE to mar the landscape. This reduces the overall cost of the Lift Station or Underpass Pumping Station.

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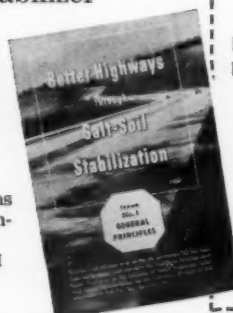
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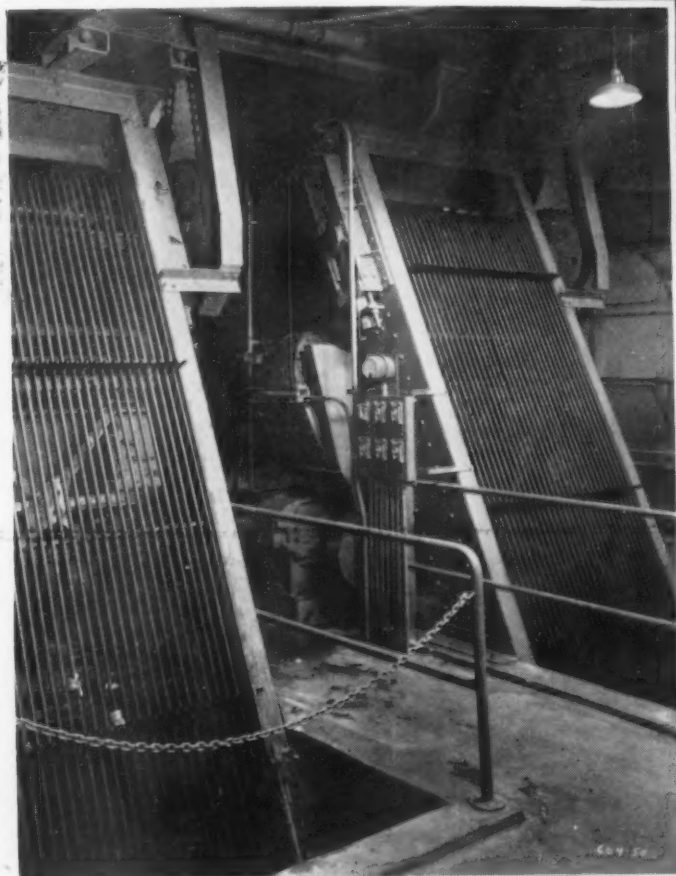
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**for dependable performance...
low maintenance...**

Jeffrey BACK-CLEANED Screens

The treatment of water, sewage and industrial waste by mechanical means has definitely proved to be most effective and economical. It is now the accepted standard for new plants, including those for small villages.



Based on new design principles, these Jeffrey mechanically-cleaned bar screens are practically foolproof.

Jeffrey bar screens are furnished coarse or fine (as shown) with round or rectangular bars, in widths and lengths to meet job requirements. Write for Catalog 833 on Jeffrey equipment for industrial waste, water and sewage treatment.

Other Jeffrey sanitation equipment includes:

Screening Grinders	Scum Removers
Grit Collectors and Washers	Dry Feed Chemical Machines
Sludge Collectors for Primary and Final Settling Tanks	Biofiltration Plant Equipment
FLOCTROLS (Controlled Flocculation)	Garbage Grinders
Belt and Spiral Conveyors	Bucket Elevators
Chains and Sprockets	Power Transmission Machinery
	Hydrolese Hubs
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**IF IT'S MINED, PROCESSED OR MOVED
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Get full details of this month's products . . . mail your Readers' Service card today.

"Lower the Broom" on High Sweeping Costs ...



Cleaner sweeps on all types of terrain—high-crown roads, inverted gutters, airports, freeways, etc.



Four-wheel hydraulic brakes for maximum safety. Cab protects against overhanging limbs. Greater visibility for driver.



Sweep more gutter miles per day ... Maneuver easily around parked cars.



with **MOBIL-SWEEPER**

Most For Your Money at Budget Time: Mobil-Sweeper

MANY COMMUNITIES are reporting three times the gutter miles at one-half the cost with MOBIL-SWEEPER—the modern machine that sweeps, sprays and carries the full load direct to the dump. Pick-up crews and expensive loading equipment are thus eliminated; more miles of streets are swept cleaner at lower cost.

MOBIL-SWEEPER MAKES STREET SWEEPING A ONE-MAN JOB. This rugged, compact machine likes "tough going" ... thrives on tortuous terrain. One man sweeps deep, wide gutters, sharp curb returns, steep hills, under low-hanging trees or other obstructions with ease. Right and left gutter brooms sweep dirt, bottles, cans, other trash into the path of the big full-floating pickup broom—leaving a clean 10-ft. swath (7'3" with single broom) behind.

Then, when the 2½ cu. yd. dirt hopper is loaded, the MOBIL-SWEEPER pops off to the dump—at maximum traffic speeds. Less time is wasted "dead-heading" to and from the dump ... more refuse is picked up and disposed of with fewer stops.

DEPENDABLE OPERATION—MAXIMUM SAFETY. Mobil-Sweeper is teamed with a modified International Harvester chassis and the famed Silver Diamond valve-in-head engine for better performance, fewer repairs. Four-wheel hydraulic brakes protect pedestrians; a truck-style "Safety Top" cab protects the operator, gives him the visibility—and safety—he needs to do the cleaning job.

**For complete information on how Mobil-Sweeper solves your
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MOBIL-SWEEPER

DIVISION OF THE CONVEYOR CO. • 3260 E. Slauson Avenue, Los Angeles 58, California

THE CONVEYOR CO. 3260 E. Slauson Ave., Los Angeles 58, Calif. PW-01
Gentlemen: Please send catalog, with complete details and specifications
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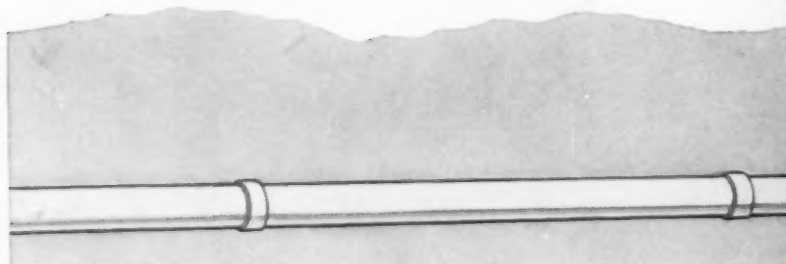
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Low land, flat grades?
High water table?



Rolling land?
Excavation problems?



Whatever the problem—
Transite® Sewer Pipe

speeds installation, cuts operating costs

In a wide range of conditions, Transite Sewer Pipe and its Ring-Tite Coupling provide installation and operational *plus-advantages* that add up to important cost savings.

**[Flow Coefficient
n=0.010]** For instance, with Transite Sewer Pipe, specified velocity of flow can be attained at a minimum grade. Initial savings may also be reflected in smaller pipe sizes. Its unusually low flow coefficient (n=0.010 derived from the Manning formula) makes this

possible. This means less cubic yards of excavation, and may also mean . . . elimination of pumping . . . location of treatment plant at higher elevation . . . lower installation costs especially if in wet or ground-water conditions.

[Tight Joints] Where ground water conditions exist (due to a constant water table or during seasonal rains) Transite's Ring-Tite Couplings are *tight* . . . thus treatment-plant dollars are spent to treat *normal* sewage only, not excessive and unnecessary infiltration.

[Strength] Made of asbestos and cement, Transite Sewer Pipe is strong and durable. It withstands heavy load stresses, eliminates expensive cradling in many cases. It is available in two strength classifications.

Transite Sewer Pipe is easily handled, quickly assembled and lowered into trench where it adjusts more accurately to line and grade. The Ring-Tite Couplings are easily and quickly pulled, forming tight, flexible joints that *start* tight and *stay* tight.

For your copy of TR-94A, the helpful widely used Sewer Design Flow Chart, based on the Manning formula, write Johns-Manville, Box 60, New York 16, N. Y.

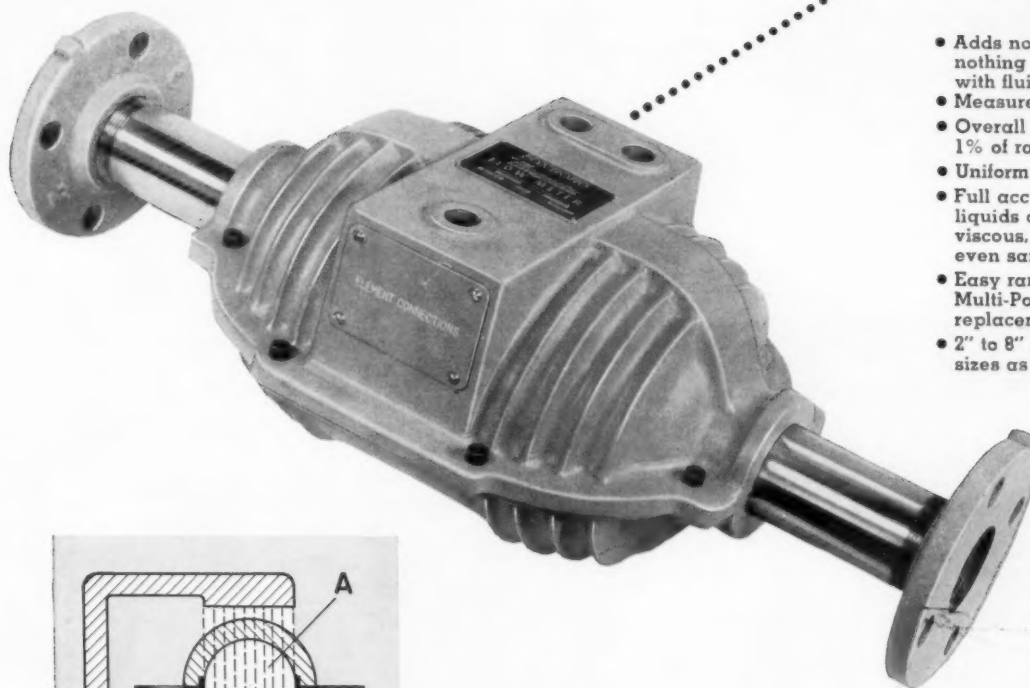


Johns-Manville TRANSITE SEWER PIPE

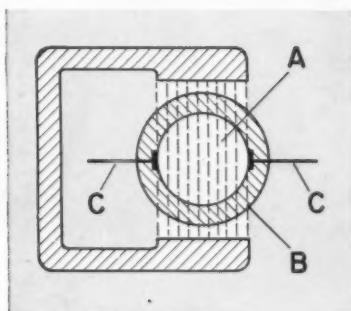
THE PIPE WITH THE TIGHT JOINTS

Thousands use our Readers' Service card to keep up to date . . . do you?

NEW! a flow meter with no flow restrictions!



- Adds no pressure drop — nothing inside pipe to interfere with fluid flow.
- Measures fluid velocity directly.
- Overall accuracy better than 1% of range over entire scale.
- Uniform flow scale.
- Full accuracy sustained even on liquids other meters can't handle: viscous, corrosive, or pulpy — even sand-water slurries.
- Easy range change — either by Multi-Point Switch or range coil replacement, as preferred.
- 2" to 8" sizes standard — larger sizes as required.



SIMPLE, TROUBLEFREE, OPERATION

The Foxboro Magnetic Flow Meter operates on the same principle as a power generator. A magnetic field (A) is maintained through a standard pipe section (B) of stainless steel or other non-magnetic material. This pipe section is lined with Kel-F® or other insulating material. Liquid passing through pipe acts as moving conductor, generating an electric voltage which varies in proportion to liquid's average velocity. Flush electrodes (C) in pipe wall "pick up" this voltage which is recorded in desired flow units by Dynalog Electronic Recorder or Controller.

FOXBORO
MAGNETIC
FLOW METER

This premium-performance meter measures *magnetically* the flow rate of virtually any liquid except hydrocarbons. It completely ignores such common metering headaches as turbulence, suspended solids, and variations in conductivity, density, and viscosity. It even measures reversing flows.

Installation is simple. The magnetic spool piece connects into the line like any equivalent length of pipe — no seals, purges, meter runs, or straightening vanes required. Connects by 2-conductor cable to remote Dynalog Electronic Flow Recorder.

Maintenance is practically eliminated. There are no pressure taps to become plugged or frozen, no working parts to foul.

Foxboro Magnetic Flow Meters are already in use on such widely different liquids as beer, sand-and-water, rosin size, rock-and-acid slurry, viscose, and highly corrosive liquid detergent. Find out how this precise, troublefree flow meter can help your processing. Write for complete details.

THE FOXBORO COMPANY, 263 NORFOLK STREET, FOXBORO, MASS., U. S. A.

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**Foremost in
FLOW METERING**

FACTORIES IN THE UNITED STATES, CANADA, AND ENGLAND

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The **POWER** behind City Hall (and that isn't all)



The lights will never go out in the City Hall of Cabool, Missouri, for lack of electricity. Behind the regular source, a Cat* D318 Electric Set serves as standby power, ready to go into action in any emergency. This set also insures the city's telephone service and water supply against power failure.

Purchased by the city during an emergency, the D318 has since then proved its usefulness on several other occasions. Besides its reliability, it has many other advantages to recommend it. These advantages are common to *all* Caterpillar Diesels. For example, they take up little floor area and are easy and inexpensive to install—no heavy concrete foundations or costly overhead construction required. When installed, they're easy to run—you don't have to pay high-salaried mechanics or operators to look after them. Another saving: when running, they use low-cost No. 2 furnace oil *without fouling*. That means cheaper fuel, less of it, less maintenance and less down time.

And if you need service, you can count on it fast—any hour of the day or night—from your Caterpillar Dealer.

There's a unit or combination of units *just right* for your requirements—electric sets and engines in 12 sizes up to 315 KW and 500 HP. Honestly rated, they deliver all the power shown in the specification sheets. Ask your Caterpillar Dealer to *prove* they're a good investment for your city!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks—®

**CAT POWER
MEANS DEPENDABLE
PERFORMANCE**

THE FACTS ABOUT

Dual Disposal

OF GARBAGE and SEWAGE

S. L. TOLMAN,

Manager of Sales,

Sanitary Engineering Division

The Jeffrey Mfg. Co.

COMBINED garbage and sewage treatment plants have been built in the United States during the past two decades in substantial number and a great deal of useful knowledge has been gained from them. Twenty years ago, the idea of dual disposal was scoffed at by many and only the more courageous dared to give the idea a fair trial. It is enough to say that the dire predictions have not materialized; in fact, operating results have proved that not only is dual treatment possible, but that it has economic advantages that should not be overlooked in these days of high plant costs and operating costs. It has now been definitely proved that garbage solids (which are largely organic) respond to aerobic and anaerobic methods of treatment as easily as do sewage solids.

It therefore becomes necessary only to design the plant for the combined sewage and garbage load. Since the characteristics of garbage and sewage solids are now quite well defined, it is a relatively simple matter for a competent engineer to design the plant for this combined load. After the decision has been made to construct a dual plant, it becomes a matter of economics as to whether the garbage

will be ground in central stations to be transported via the city sewers to the plant, or whether the garbage shall be hauled by truck to the plant and there ground and pumped directly to the digesters. The first method will result in some additional organic load on the secondary treatment process which will enlarge this part of the plant, but the other parts will not change in size. Of course, larger digesters and sludge handling and drying facilities must be provided if garbage is to be treated, but these enlargements are the same whether central grinding stations are used, or whether garbage is ground at the plant.

From a cost standpoint, the record at Richmond, Indiana, is very attractive. The figures supplied by W. E. Ross, Superintendent of the Richmond, Indiana Sanitary District, for the year 1953, show that the cost of operation of the garbage grinder and conveyor, including pumping of slurry to digesters amounted to \$1.05 per ton of green garbage, while the value of garbage gas amounted to \$1.79 per ton of green garbage. The net profit per ton of green garbage there amounted to 74 cents a ton.

Assuming a fifteen-year life on all mechanical equipment, the cost for depreciation, maintenance and repair would be as follows: For



● APRON feeds garbage to grinder at Richmond, Ind., treatment plant.

maintenance and repairs, 18 cents per ton of green garbage; and depreciation, 40 cents, making a total of 58 cents per ton of green garbage.

Thus, these figures show a profit even when maintenance and depreciation are considered, and this is not true with any other method of disposal.

While these figures are from the operating experiences at Richmond, Indiana, it is believed that similar results are possible from other cities where comparable operations are obtainable.

In large cities, further economy is made possible by the location of central grinding stations at strategic points on the city sewers. Not only is a saving in haul possible, but oftentimes new collection routes can be arranged which will cut down the collection costs. Since garbage collection and hauling costs are extremely high in any city, it is here that real savings are possible if a careful study of this problem is made by a competent engineer.

Uniform Strength Sewage

Another advantage, of several grinding stations, especially in larger cities, is that the organic load at the sewage treatment plant is leveled out. The greater the distance from the plant to the grinding station, the more this will be true. For still further leveling out of this load, collection of garbage and grinding of same could be done at night. If ground garbage is added so as to arrive at the plant at times of low sewage flow and strength, sewage of much more uniform strength could be provided than, as a rule, prevails today. This would be of considerable advantage, as any operator knows that many headaches could be eliminated if he could handle sewage of uniform strength 24 hours a day. This does not imply that addition of ground garbage will give a sewage of completely uniform strength, but it could be made to lessen the valleys in strength that now occur in the early morning hours at most plants.

As to the effect of the ground garbage on the city sewers, there need be no fear of stoppage occurring from this material. Combined sewers are designed for minimum velocities of approximately 3 ft. per second, and since the grinding stations would be located only on the larger sewers, the velocities and the volume of flow would be sufficient to prevent stranding of garbage solids. With a proper site chosen to insure a sufficient velocity and volume of flow in the receiving

sewer; a grinder selected to allow garbage solids only of a specific maximum size to be discharged into the sewer; and control of the feed to the grinder to keep out heavy non-organic matter, there can be certainty that no sewer stoppages will result. Garbage grit, amounting to approximately 40 lbs. per ton of garbage, must be waterborne to the treatment plant (unless it is removed by a grit washer), but since the size of particles will be smaller and their specific gravity lower than the largest and heaviest particles of sand and gravel now carried by sewers, there should be no alarm because of the addition of a smaller amount of lighter and more easily transportable garbage grit.

Experience at Indianapolis, Indiana in the summer of 1935 confirms the above. During this period, 17,256 tons of garbage were ground and added to the sewage at the West Street Grit Channels approximately 2 miles from the sewage plant. Experiences at St. Louis, Missouri for many years show that, even if the garbage grit is not removed, all the garbage solids can be transported via the city sewers if the garbage is ground fine and if conditions of flow in the city are right.

Since the cost of garbage hauling is considerable, substantial savings may be obtainable by use of central grinding stations, but these savings must be balanced against the additional cost of the sewage plant, both in first cost and operating cost, caused by the additional garbage load on the sewage treatment plant, to see whether central grinding stations are cheaper than hauling the garbage to the plant and putting the ground garbage directly into the digesters.

Effect on Sewage Flow

As to the effect the addition of garbage has on the volume of sewage treated, if garbage is added to sewage at a rate of 2 tons per mil-

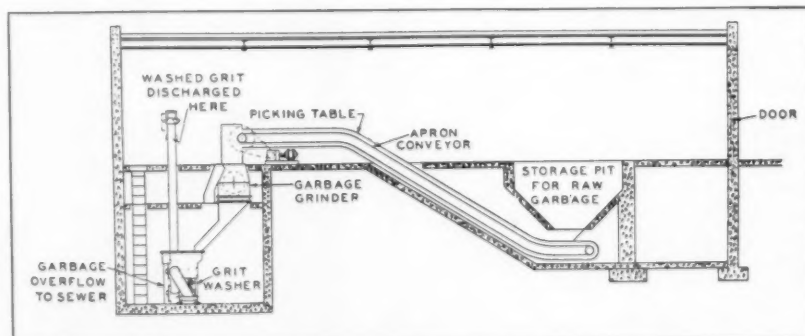
lion gallons of sewage (which is a very good figure for most cities) and if the slurry contains 5 percent solids, the actual increase in flow at the plant due to the added garbage slurry is 0.3 of 1 percent which, of course, is negligible.

Garbage grinding stations properly designed are not objectionable. Exterior architecture should harmonize with the neighborhood; grounds should be landscaped to present a pleasing appearance. The stations should be neat in appearance and should be provided with duplicate conveying, grinding and grit washing equipment. Ample provision should be made for good housekeeping so that the entire equipment, floors and walls can be washed down with water at the end of each day. Provision should be made for adequate quantities of hot water for washing purposes when needed. The building should be made to be closed at all times except when trucks are dumping. Adequate ventilation should be provided and all air leaving the building should be deodorized to avoid complaints of odors from the stations. In this connection, the use of ozone is recommended as this has been very successful at Wards' Island in New York City in deodorizing the gases from the sludge storage building. Acoustic walls and ceilings should be used if the noise from the grinding is liable to be objectionable.

Effect on Treatment

The effect of the ground garbage on the sewage treatment plant providing for complete treatment is not as great as might be expected, but additional plant structures should be provided as follows: None for screens and grinders; grit collecting and washing equipment; and primary settling tanks. The secondary treatment process will require 15 percent more capacity. The secondary settling tanks need be no

(Continued on page 169)



● SECTIONAL view through grinder installation showing essential plant units.

TRAFFIC SIGN PROGRAM

Reduces Accidents

JOSEPH D. NADON,

Traffic Engineer, El Paso, Tex.

THE rising traffic accident rate caused the Mayor and City Council of El Paso, early in 1952, to give serious consideration to this problem. Their studies of the various factors involved culminated in September, 1953, with the establishment of the city's first full-time traffic engineering department.

In order to achieve immediate and effective results in our accident prevention efforts, this department's first action was to modernize our traffic signs, particularly our STOP signs. Previously all signs—including STOP signs—were painted on flat or embossed sheet iron or cast aluminum with no particular emphasis on uniformity as to size or color. At a few particularly hazardous intersections signs were reflectorized by imbedding highway glass beads in clear varnish applied over the sign surface. This resulted in impairing the legibility of the sign during daylight hours—since the legend was covered with a coat of varnish and a layer of glass—and a rather dim and distorted legibility during hours of darkness.

An important step was to develop and adopt a specific uniform sign manual in accordance with nationally recommended standards as approved by the AASHO, the ITE, and the National Conference on Street Highway Safety. This manual was adopted in toto by this department for use in El Paso, with the exception of the recommended yellow STOP sign.

In this respect, and in view of the

recent recommendation of the "Joint Committee on Uniform Traffic Control Devices", this department took two steps: First, we sent questionnaires to five other major Texas cities, asking their impressions of the newly developed red STOP sign; second, we installed these red signs—made of "Scotchlite" brand reflective sheeting—at one major intersection to get the reaction of our local citizenry.

Returns from our questionnaire showed that each of the five major Texas cities queried was using the red STOP sign to some extent; and that at least one city was planning eventually to replace all existing stops with these new signs. Even more indicative, however, was the reaction in El Paso to the sample installation. Our office received several dozen telephone calls, postcards, and letters, all heartily endorsing the change to the red STOP sign.

However, recognizing the fact that the proof of their value is in public observance rather than public acclaim, we have watched with considerable interest the accident and violation record of this pilot installation. In the six months since the installation of these red signs, there has been one daylight, and no nighttime accidents at this intersection, as compared to three daylight and five nighttime accidents in the six months immediately prior to the installation of the red STOP signs. Police records indicate that stop sign violations have been practically eliminated at this location. With this information, and with public opinion solidly behind us, our department established the fully reflective red STOP sign as the

● **MR. NADON** in the city sign shop. At rear is applicator for bonding reflective sheeting to the standard sign faces.

standard for this city in the future.

Our next problem was to manufacture the signs in quantity. To do this, we purchased a new heat-lamp vacuum applicator and set up a modern silk-screen sign process in our city paint shop.

It has been found that the average installed price of "STOP" signs, including labor, under the old method of signing was approximately \$6.28. The average cost, installed, under present methods is \$5.93, despite the slightly higher initial cost of adding reflective sheeting. This reduction has been made possible through use of the heat-vacuum applicator and silk screen processing which has raised our sign production rate from approximately twenty signs per day by two men to nearly fifty signs per day by one man.

In the three months that our shop has been in full operation using these modern methods, we have replaced approximately 200 of the obsolete signs, and manufactured and installed approximately 300 new signs. It is anticipated that our complete renovation program, involving nearly 2,500 traffic signs, will be completed in about three years at an estimated cost of \$10,000 over and above the cost of any additional signing projects which may be undertaken in that time.

From this it is clear that the reduction in labor costs alone will justify the investment the city has made in equipment, but what is even more important, the clearly visible and legible day and night traffic signs now being installed in El Paso will be an important factor in reducing the number and severity of accidents on our streets.



Water Treatment Removes

C. R. HARLOCH, Water Plant Supervisor and M. R. DOWLIN, Water Plant Operator

THE United States Penitentiary on McNeil Island, Wash., is at the lower end of Puget Sound. The Island comprises approximately 4,400 acres. This includes woodland, pasture, farm land, institutional buildings, residential area, and roads. The population of the Island is approximately 1,600 persons.

McNeil Island obtains its water supply from surface-run-off water impounded in a reservoir during the rainy season for domestic use, fire protection, and irrigation. The ground formation of the watershed is mostly clay. The watershed is forested with small, second-growth fir. There is a heavy annual crop of ferns. There are three natural drainage areas into the Sound. Small, earth-fill dams have been built to impound this water which is pumped to a large, artificial lake in the center of the Island. The capacity of this lake is approximately 700 million gallons. Below this lake is another reservoir with a capacity of 24 million gallons, naturally located so that it catches all discharge from the upper lake. The water filtration plant is located on the lower reservoir.

The water on McNeil Island is soft and very highly colored. It is also high in manganese and iron content. It is the partially oxidized compounds from the dead vegetation that give the visible color to the water. They behave as a colloid and bear a strong negative charge in solution. Being complex organic compounds, they do not lend themselves readily to analysis as do the inorganic compounds ordinarily encountered in water. As the water flows down off the hills, it reaches mucky areas where it absorbs iron and manganese combined in organic compounds. The problem, then, is the removal of color, iron, manganese, and swampy tastes and odors.

Algae Control

There is an intake tower and low lift pumping station at both the main lake and the lower reservoir to supply water to the filtration plant. Ordinarily only the lower reservoir is used. Microscopic counts of algae are taken regularly from

the lower reservoir to determine when the water shall be treated. The DM copper test is used to determine the amount of copper to be used. *Anabaena* is the predominating organism. No attempt is made to control the algae in the main lake. All irrigation water is drawn from the main lake. Water flow from the main lake to the lower reservoir takes care of the demand except during the late summer. When water is let into the lower reservoir from the main lake, it is immediately treated with copper sulphate.

Water is drawn for use at the plant as near eight feet below the surface as possible. The thermocline is approximately twelve feet below the surface. Below this point, the water is devoid of free oxygen in the summer months, is very high in iron and manganese, and the odors are severe. At the surface the algae oils are greater and on being chlorinated cause disagreeable odors.

The filtration plant was originally built with a capacity of $\frac{3}{4}$ mgd. It was a conventional plant consisting of over and under baffle mixing; two plain sedimentation basins in parallel; two 12 by 12 ft. sand filters; and a 30,000-gallon clear well. The plant was very inflexible and it was impossible to turn out a satisfactory effluent. With the experience gained in the operation of this plant, it was possible to put it to practical use when it was decided to enlarge the capacity of the plant in 1948. The existing structures were put to

good use and incorporated in the design of the new. The present capacity is two mgd.

Treatment of Water

Manganese Removal—In the removal of manganese, it is the usual practice to raise the pH to 9.2 or above to flocculate the manganese. This is not possible in a colored water as it must flocculate, settle, and filter in the acid range to remove the color. Chlorine alone will oxidize manganese but the reaction is very slow. The usual result is that filters act as contact beds to remove the manganese, causing short filter runs and large build-up in the size of the filtering media. Chlorine dioxide will oxidize the manganese almost immediately. It is our practice to add chlorine dioxide with our chlorine when the manganese content of our raw water is above 0.1 ppm. The dosage is determined by the color returning in the water in the settling basin. If all the manganese has been oxidized as the water enters the mixing basin the alum floc will remove it. If not, the color in the water will return when the water gets to the settling basins.

Color Removal—We find that there is a direct relation between the color present and the amount of alum necessary to remove it. The substitution of sulphuric acid for a portion of the alum required in order to depress the pH to the observed optimum will not give a floc. The color is colloidal and it bears

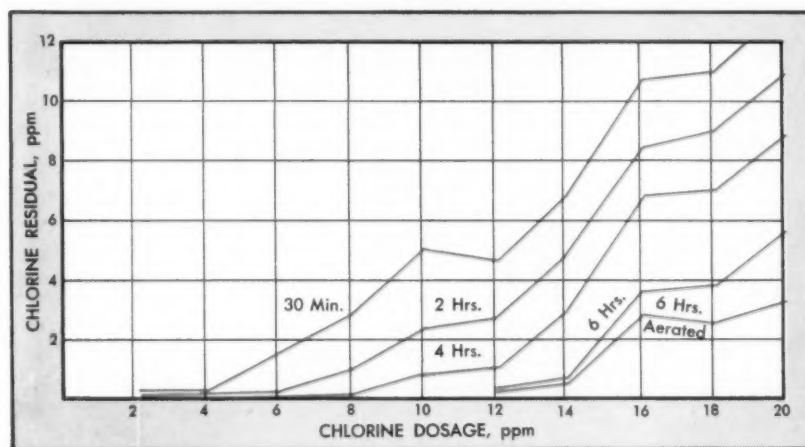


● McNEIL Island water treatment plant, rear view showing settling basins.

Manganese, Color and Odors

a strong negative charge. Alum is amphoteric. In an acid medium the alum floc bears a positive charge, in an alkaline medium, a negative charge. It is difficult to remove all the color with alum alone. Up to a certain point, chlorine can be substituted for alum in the ratio of one pound of chlorine for two

by algae or decaying vegetable matter with chlorine and chlorine dioxide. Chlorine demand tests are run regularly. With this water, there is a steady drop in the residual over the first six hours contact. Beyond this time, the drop is very small. We do not have an overall break-point, instead, a series of short plateaus.



● CHLORINE demand-time functions. Residuals by acetic acid-starch iodide.

pounds of alum. Not all the color is in the colloidal form; some is in the form of a true solution. That portion in the solution form can be removed by being absorbed by the alum floc but it can be more easily removed by oxidation with chlorine.

The floc will be pin point in size, will not settle, and a large amount of alum will pass through the filters unless there is at least 10 ppm of residual alkalinity in the settling basins; 20 ppm of residual alkalinity in the settling basins seems to be optimum for the best flocculation. The alkali added to make up this alkalinity must be added not less than ten minutes after the alum is added and preferably at several points along in the mixing chamber in order not to raise the pH of any portion too high and thereby release color. The pH must be kept as near the isoelectric point as possible. The speed of flocculation is most important. Color floc is very fragile, and very slow in settling. Optimum speeds of flocculation with our water are half the conventional speed used for flocculation of turbid water.

Odor Control—It is our experience that we can remove any odor caused

We maintain a minimum of 0.4 ppm of free chlorine residual in the finished water. We chlorinate heavily enough so that there is no odor of any kind at the hot water tap (80°C.). When an odor develops at the hot water tap, we increase the chlorine dosage to the end of the next plateau shown by the demand test. With this method, swamp or algae odors can be reduced to where an acceptable water can be delivered. However, there is a decided chlorinous odor at the cold water tap if nothing more is done to the water. Aeration of the finished water to a constant pH will eliminate those chlorinous odors producing water with a stable residual and odor free. Aeration also drives off the carbonic acid dissolved in the water from the alum reaction resulting in much less alkali being used for pH correction. The chlorine residual is incidental to our treatment. Chlorine dosages are determined solely by odors at the hot water tap.

Present Plant Layout

The raw water is pumped into the original mixing chamber. Chlorine

and chlorine dioxide are added at this entry. This gives a contact time of about ten minutes while the water is flowing through the old mixing chamber. At the end of this ten-minute period, alum is added just as the water enters the rapid mix. From the rapid mix the water flows to the flocculation chamber. This chamber is divided into four sections, each section having a gradually diminishing speed as it flows toward the settling basin. The mixing speed is regulated by a horizontal longitudinal paddle wheel, driven by an electric motor with gear speed reducer and chain drive to the paddle wheel shaft. Soda ash is added at the entrance to the second section to adjust the alkalinity to a residual of 20 ppm.

The water flows from the flocculation chamber to a Rex Vertiflow settling basin. This basin is equipped with skimming weirs dividing the basin into four sections. A sludge removal system is provided to remove sludge as necessary. From this basin the water flows into the old settling basins, giving added time for the chlorine reactions to go to completion, as well as more settling time for the removal of floc.

After leaving these settling basins the water flows to four 12 x 12-ft. square filters. These filters are equipped with Palmer filter sweeps and Anthrafil filtering media; and are supported by aluminum plates resting on concrete piers which form the underdrains. The filters are controlled by Simplex rate of flow controllers, rate of flow, and loss of head gauges.

The filtered water drops into the clear well which is divided with concrete walls so that the water flows through a chamber 12 feet deep, where it is aerated. Air is furnished by a 350-cubic foot per minute Ingersoll-Rand air compressor. The piston is equipped with carbon rings so that it is not necessary to use oil to lubricate the piston. As the water leaves the aerator, soda ash is added to correct the pH to the calcium stability point.

From the clear well, the water is pumped to storage tanks on the distribution system. There is one 800 gpm two 400 gpm, and one 200 gpm centrifugal pumps to pump the water from the clear well.

BUILDING A DEEP SEWER IN A PEAT BOG

G. M. BARCLAY, Superintendent of Sewers, Vancouver, B. C.

CONSTRUCTION of 3,000 feet of trunk sewer through a peat bog was one of the recent projects undertaken by the Sewer Department of the City of Vancouver. Depth of the sewer averaged 16 feet and peat was encountered to a depth of 12 feet. A difficult shoring problem presented itself as the sides of the trench had a tendency to collapse without warning before any temporary support or runners could be installed.

In order to overcome this difficulty special prefabricated timber frames were assembled alongside the ditch within reach of the backhoe, and when a sufficient length of

4 to 6 ft. apart. At the ends of the liners and at right angles to them, two 2" x 12" x 12 to 16-ft. "soldiers" were placed; then two 3" x 12" x 12-ft. stringers were placed over the liners with a shingle shim or spacer between the "soldier" and the stringer. These timbers were all bolted together at the center of the point of crossing with $\frac{5}{8}$ " eye-bolts to which tie-rods were later hooked. The tie-rods were of $\frac{5}{8}$ " mild steel with a turnbuckle in the center. The sides of the frames were then raised, 4" x 6" struts and tie-rods put in place and the turnbuckles tightened to complete the frame assembly. In the first few



● TYPE of hardware finally developed for holding the forms in proper place.

trench had been excavated one of these prefabricated frames was picked up and set in place. Vertical sheathing was then placed in position in the frame. This worked well as it was not necessary for any workmen to be in the trench ahead of the timbered sections.

Frames 12 feet in length were constructed. The procedure followed was to lay 2" x 12" x 12-ft. liners parallel to each other and

sets, placing the 2" sheathing boards between the liners and the stringers was difficult. This was overcome by the use of the shingle shims or spacers to increase the clearance between the stringers and the liners.

A rope sling for lifting the frames was made by splicing four lengths of $\frac{3}{4}$ " rope to a 6" ring, the free ends of the ropes being fitted with hooks. To lift the frames, these

hooks were fastened to the eye-bolts at the lower corners of the timber frames. A chain fastened to the hoe bucket was then attached to the sling. As the frame is picked up and lowered into the trench ahead of the timbered section, ropes are used to guide the frame into position and the hoe bucket to adjust the frame in position in the trench. The 2-inch sheathing boards are dropped between the liners and stringers. In pushing the sheathing boards down into place the hoe bucket is used to advantage.

As the diameter of the sewer diminishes and the trench width narrows, shorter tie-rods for holding the frame together are required. This problem resulted in the adoption of a new tie-rod, adjustable to varying widths of trench. The new tie-rod has a short eye-bolt fitted on one end of the turnbuckle to which a length of chain is attached. The corresponding eye-bolts on the frames were changed to chain-grip eye-bolts to permit adjusting the length of the chain and in this way the tie-rods were made suitable for assembling frames for different widths of trench. This hardware has since been used on a variety of sewer jobs.

When frames and sheathing are in place any irregularities between the sheathing and the sides of the trench caused by crumbling or caving of the earth are filled in if necessary. This makes everything tight and leaves a cleaner working area along the side of the trench. It was found that in most trenches the hardware could be removed as the pressure from the sides keeps the timber sets tight, thus cutting down the number of hardware sets required for the job.

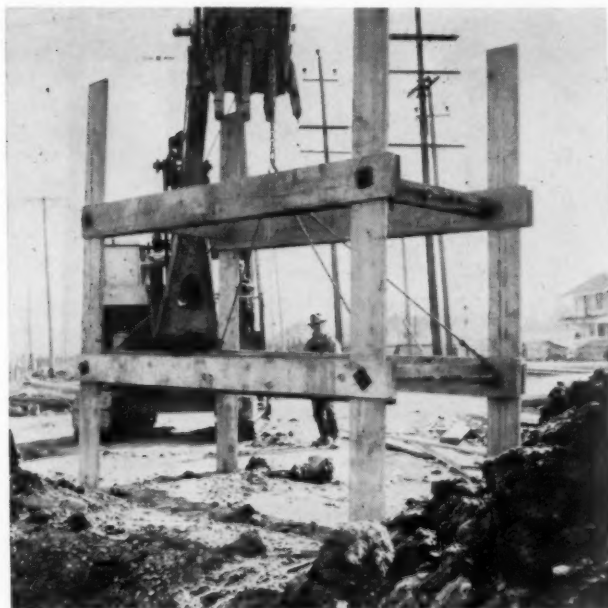
The first sets of hardware made had the eye-bolts held in place by plate washers and nuts on the outside, and plate washers on the inside of the frames. This arrangement did not allow the eye-bolts to be withdrawn, as invariably the nuts would turn with the eye-bolts. The whole side of the set would then have to be pulled from the backfilled ditch with resultant breakage and loss of timber. This difficulty was overcome by spot welding the nuts to 2" x 2" x $\frac{1}{8}$ " plate washers and nailing the corners of the washers to the liners. The lower liners are usually lost but the balance of the timber can be pulled much more easily and with less loss of sheathing boards than formerly.

The writer found it was not prac-

tical to handle frames with "soldiers" over 16 feet in length. Where ground conditions are favorable for the back-hoe to dig to a greater depth, the procedure followed on reaching grade is to lower the frame until the "soldiers" touch the bottom. When the right lengths of sheathing boards are not available,

and securely held at the lower stringer. The next board is driven to the bottom of the ditch and this alternate method of installing the sheathing is carried on throughout the length of the frame. The spacing of the boards depends, of course, on the nature of the ground. When the sheathing is completed another

are poor was adopted as a safety measure to permit shoring trenches without exposing the workmen to hazardous ground conditions. It has been very satisfactory in this regard and, in addition, it has been our experience that the use of these sets has resulted in an increase in the daily footage of trench timbered.



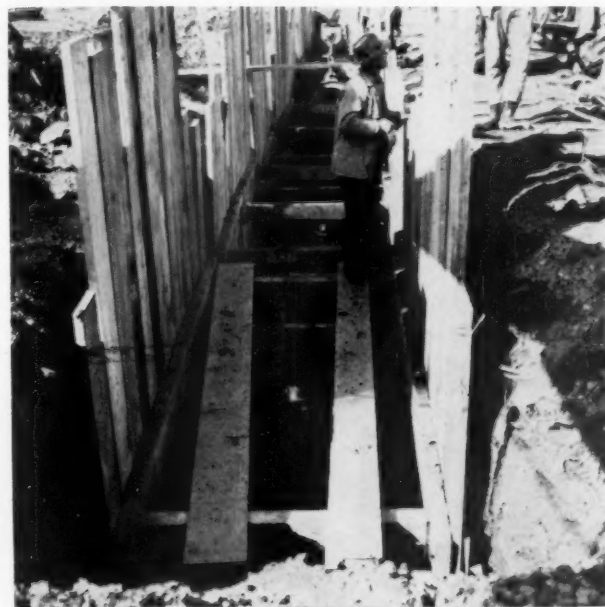
● FORM has been assembled by trench and is ready to set.



● BACKHOE being used to adjust the frame to its place.



● FRAME is placed and made ready for the sheathing boards.



● SHEETING boards are in place, ready for work to begin.

or where they are too cumbersome to handle, the practice is to stagger them. The sheathing board next to the "soldier" is driven down first, until the bottom of it can be wedged

set of stringers and struts is placed just below the top of the trench to hold the upper ends of the boards.

This method of timbering in trenches where ground conditions

The work was carried out under the general direction of the City Engineer, J. C. Oliver, M.B.E. The writer, as Superintendent, was responsible for the construction.



TRAFFIC SIGNS MAKE ROADS SAFE *Now!*

D. O. OPSTAD,

General Sales Manager, Reflective
Products Division, Minnesota Mining
and Manufacturing Co., St. Paul, Minn.

HIGHWAY authorities are placing more and more emphasis on the traffic sign as one answer to the national traffic problem—55 million vehicles traveling on roads designed for about half that number, traveling faster and traveling at night.

As a result of this increased attention and study, the traffic sign is undergoing a series of fundamental changes to step up its effectiveness.

About 20 years ago there were 28 million vehicles in the United States. The intervening years marked an increase in traffic volume of nearly 100 percent because of the tremendous development in the automotive industry. . . and a recent study in

Minnesota predicts a further traffic volume increase of 30 percent within the next ten years.

Part of the answer is new roads, engineered to accommodate the heavy traffic volume and modern speeds of today and the future. But the limitations of time and money force planners to view new roads as a long-range development as evidenced by highway statistics of The Bureau of Public Roads.

Highway construction—including new roads and improvement of old roads—is progressing at the rate of only about 55,000 miles of highway per year. In 1950, highway construction created or improved 51,000 miles of roads; in 1951, 55,000; in 1952, 58,000. The 1952 figure—the largest and latest—is still less than two percent of the nation's three million miles of existing roads. These figures show that optimum safety from new roads is literally years

away, even though highway authorities are building and modernizing as rapidly as time and money allow.

But what about those important highways which carry the brunt of today's traffic? The answer to making these roads safer lies in more efficient use through traffic control, and improvement of through up-to-date maintenance—not alone toward preserving the character and quality of the road but with an eye toward service to the public—service which begets safety and comfort for the traveler.

From local and national studies the properly designed traffic sign is emerging as one of the very important factors of traffic safety. State and local authorities are utilizing the traffic sign to make existing roads safer—immediately. The cost is infinitesimal by comparison with building projects. A newspaper report from Texas estimates that one mile of unimproved rural road would cost about \$15,000 to improve adequately—to bring it up to the lower standards of modern traffic needs. The cost of a signing program which would have an immediate and beneficial effect on the safety record of that road, using the best materials and an adequate number of signs, would be less than \$150 including labor costs for installation—about one percent of the cost of reconstruction.

Getting Results Now

Traffic signs obviously do not take the place of engineering improvements, but the low cost and immediate results enable communities to do something now to make their



● DAYTIME appearance of a well-marked but dangerous section of rural highway.

existing roads safer until the time and money for construction become available. Through traffic signs, authorities can warn the motorist of the sharp curves which are hazardous at modern speeds; warn him of the bridge too narrow to pass two cars comfortably—or the concrete abutment which juts almost imperceptibly into the roadway; of the narrow, winding road which has become hazardous at modern speeds; to guide him to his destination safely, conveniently and without confusion.

With this increased emphasis on the traffic sign, highway authorities are directing greater energy toward its development, resulting in a constantly improving technique. Signs are undergoing a period of great development, for authorities have recognized their values and the need for national uniformity.

Signs are becoming larger—a necessity created by modern speeds. At 60 miles per hour the motorist is moving 88 feet per second—nearly one-third the length of a football field. But his reaction time is the same as it was when 25 miles per hour was top speed. At 60 miles per hour the average driver will travel 55 feet before he can move his foot to the brake, and another 171 feet before he can bring the car to a complete stop—a total stopping distance equal to three-quarters the length of a football field.

Lettering and Size

The Bureau of Public Roads letter designs are legible approximately 50 feet per inch of letter height. A sign message printed in letters six inches high is readable to a motorist driving 60 miles per hour 300 feet away—giving him three and one-third seconds before he is past the sign.

Obviously with modern speeds the driver requires more reaction and stopping time. For that reason engineers are designing larger signs to make them visible and readable at greater distances. The Manual on Uniform Traffic Control Devices states that warning signs on rural roads must be a minimum of 30 x 30 inches or larger, depending on increased allowable speeds.

Guide signs are among the largest traffic control signs on the road because a large share of the burden of smooth traffic flow rests upon them. Without proper route information the motorist may become confused and hesitant; concentrate on looking for turnoffs instead of traffic; stop or slow down in the traffic lane to check his road map; or

be forced into other accident-creating situations. With enough guide signs to point the way—and messages large enough to give the driver plenty of reaction time—traffic keeps moving and many dangerous situations are relieved.

The New York Thruway makes excellent use of this principle. Motorists are given notice of conditions as far as a mile in advance and the information is repeated two, sometimes three times, to allow traffic plenty of time to separate itself safely and without confusion before it reaches the condition.

One signing trend stemming from high speed limited access roads is the use of colored reflective backgrounds on guide signs—reflective so the sign appearance remains identical night and day. The green or blue colored background and silver letters identify a direction sign just as the yellow diamond

of route marking in which color is a directional aid to the motorist. The background of the reflectorized route markers in both states are orange for northbound routes, green for southbound, brown for eastbound and blue for westbound—only four colors are used to keep the system simple. The system has proved especially beneficial in facilitating a smooth flow of traffic, especially in cities and other congested areas where the motorist, though perhaps on the right route, frequently confuses the direction he is traveling. A statewide information program through newspapers, radio and television helped explain the system to residents when it was installed, and large signs at state and city entrances explain it to out-of-state drivers.

Modern traffic demands have also created the need for reflectorization. Twenty years ago the car



● OVERSIZE guide sign gives driver time to get to the right lane and slow down.

identifies warning signs. This modern color development produces an attractive, harmonious sign that stands out in good contrast with scenic surroundings. All signs are reflectorized for nighttime utility and are brightly visible in full color under auto headlights.

Engineers who have made sign studies find that, where color is used, reaction time is faster; that color is a mental stimulant which helps relieve the monotony of tedious driving—especially at night when the reflectorized shape, legend and color stand out in the darkness—thus reducing the accident potential of a fatigued driver.

Colored Route Marking

The states of Washington and Arizona recently adopted a system

owner generally put his car up at sundown and left nighttime driving to doctors, police, firemen and others whose occupation demanded it. Today about one-third of the nation's driving is done at night. But the dangers of darkness have not been removed, as evidenced by the fact that more than 50 percent of the nation's traffic fatalities occur at night. Mile for mile, statistics show, it's about three times more dangerous to drive at night than it is during the day. Sharp curves, narrow bridges and culverts, and other hazards are doubly dangerous at night for the simple reason that the driver can't see them as well.

If the traffic sign which warns of these hazards goes off-duty at sunset it is not doing its job for that one-third of the traffic which takes

to the road at night. Late developments in reflective sheeting make possible the reflectorization of the entire sign so that its shape and color present the same appearance night and day.

Sign location in relation to the roadway is another phase undergoing change. Traffic signs are beginning to move out from the roadway and higher to get out of the spray and splash caused by fast moving cars on wet pavements. Tests show that by moving the signs two feet further from the edge of the road and two feet higher above the crown they stay clean longer—and are therefore more visible and readable longer, resulting in an improvement in sign appearance and a cut in maintenance costs.

It's interesting to note that studies are being made involving the use of traffic signs in the realm of driver-attitude control. A paper prepared by Heinz Haber, Robert Brenner and Slade Hulbert, all of the Institute of Transportation and Traffic Engineering at the University of California, advances a concept called "psychology of trip geography" in an attempt to get at driver behavior patterns and reduce auto accidents.

In the paper, published as Highway Research Board Bulletin No. 91, the authors mention signs as one important possible factor in reaching the driver's attitude. Signs, strategically located along "accident stretches," would inform the driver of attitude hazards— aspects of the road which might produce intangible effects on the driver, and result in accidents. Such signs might refer to the accident record of this particular stretch or of the possible ill-effects of altitude—particularly regarding drivers with asthma, cardiac and vascular conditions; warn of the tendency of drivers to be unaware of the altitude reached on the road because of the lack of sharp curves or steep grades; explain the hazards of highway hypnosis due to monotony, especially at night; warn the drivers that this stretch of road—perhaps with a large city beckoning as the goal of the driver—results in "hard driving" which in turn produces dangerous fatigue and promotes accidents.

Signs such as these would be an attempt to probe into the driver's attitude and make him aware of the intangible dangers that exist. By making the driver aware of the diverting psychological factors, many accidents might be prevented.

This is the goal of traffic authorities nationally—to prevent accidents

on overcrowded and dangerous highways, and to do it as rapidly and inexpensively as possible. This is why new efforts are being di-

rected toward the traffic sign which has become one of the highway engineer's most useful tools in traffic control and safety.

Radio Traffic Control System Planned for Chicago

A CONTRACT to design, develop and manufacture a radio controlled traffic light system for Chicago, Ill., has been awarded to General Electric Co. This electronic system, the first of its kind in the world, will be used to control traffic signals in a heavy traffic area just north of Chicago's Loop. Initially, traffic lights at thirteen intersections will be radio controlled. The system features the use of electronic tones which are transmitted by FM radio like that widely used by fire and police departments.

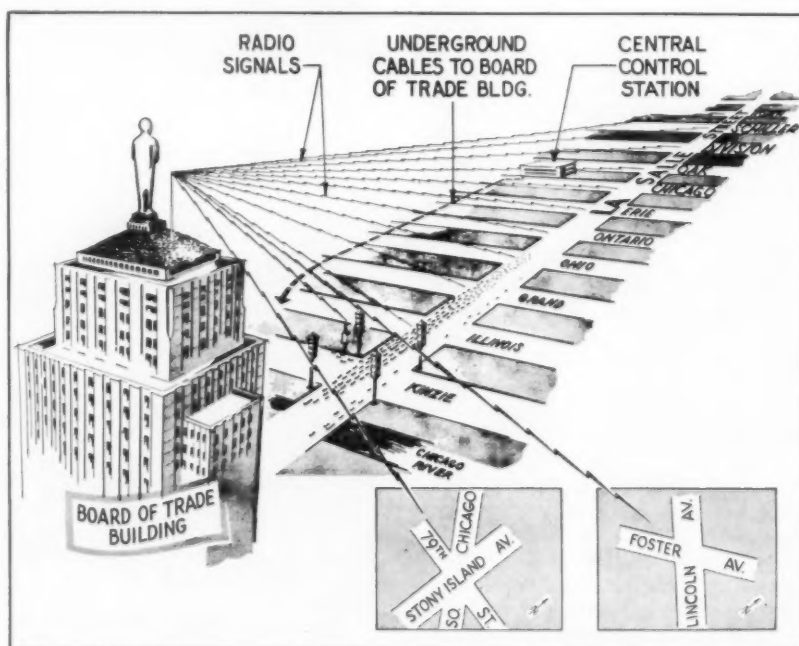
According to Chicago's traffic engineer, Ralph Michel, the cost of installing conventional means of controlling the traffic signals was prohibitive. After investigation, it was found that radio control would be much less expensive. In addition, the necessity of laying underground cable with accompanying torn up streets and inconvenience to traffic is avoided. The initial contract approximated \$34,000.

The radio antenna and transmitter for the new system will be located on top of the Board of Trade Building, the highest point in Chicago. The central control station, which will be located a short distance

away in City Hall, will be connected to the transmitter by an existing underground cable.

At pre-determined times each day, a master mechanism in the central control station will activate a tone signal. The signal will be carried by the underground cable to the transmitter and broadcast to the lights. In the receiver, at each intersection that the signal is intended to control, will be a corresponding tone switch, or decoder. Each decoder will select the signal designed for its intersection, and ignore those intended for other intersections. The corresponding tone switch in the traffic light control box at the intersection will respond to the received tone signal by changing the program (the length of time of green, yellow and red) of the traffic light. Each change of program will be accomplished in a fraction of a second.

In addition to pre-determined program changes accomplished automatically, the radio controls can be operated manually. This will allow the programs of the traffic lights to be operated in the most desirable sequence during an abnormal condition such as bad weather.



● DIAGRAMMATIC view illustrating operation of radio traffic control system.

New

CAST IRON TRANSMISSION MAIN SOLVES WATER SUPPLY PROBLEM

L. F. KOBERLEIN,

Russell & Axon,
Consulting Engineers.

THE growing city of Columbia, Ill., located in the St. Louis, Mo., metropolitan area, installed a water system some 25 years ago, drawing its water from local wells and pumping to an elevated tank. With increased growth the wells proved unsatisfactory and a six-mile supply main was laid to the Village of Dupu, water being purchased on a wholesale basis. A booster station and ground storage tank were installed on this line. This proved only a temporary solution; because of increasing water consumption the Dupu supply became inadequate so Russell and Axon, Consulting Engineers, were authorized to make studies and recommend a suitable water supply to serve future needs.

Several plans were studied and conferences held with officials of the East St. Louis and Interurban Water Company and also with the Village of Dupu. It was recommended that the City of Columbia construct its own supply main and purchase water direct from the Water Company. This would help the Village of Dupu because with the demands of Columbia removed from its system, Dupu's 10-inch main is apparently adequate, at least for some time, for the needs of Dupu and for a Water District which purchases water wholesale from Dupu.

The Water Company extended its high pressure water main along Illinois Highway No. 3 to Airport Road, in Monsanto, just south of East St. Louis and constructed a meter box. From this point the City of Columbia constructed a new 12-inch cast iron transmission line southward through Cahokia and North Dupu and then along the edge of Dupu to the southerly Dupu limits where it is connected to the existing 10-inch supply main leading to Columbia.

The location and construction of this water transmission main presented some interesting engineering

problems in order to provide a location which was most economical and yet accessible for future maintenance. The line was located along the edge of Highway No. 3 for a distance of about 6,000 feet south of the Water Company meter box and the location as well as the installation conformed with the regulations of the Illinois Division of Highways. The line then passed through the historic Village of Cahokia and an agreement was signed to use the streets for the installation. South of Cahokia the water line was laid on easements for a distance of about 5,800 feet. In general it followed land claim lines.

The most difficult construction was across the drainage canal and levees of the East St. Louis Levee and Sanitary District. This canal has levees on each side to protect the area from flood waters of the Mississippi River. In order to meet approval of the Army Corps of Engineers, it was necessary to construct the water line up over the levee, keeping it out of the "net section" designed for floods. It was then laid down in the canal about 9 feet beneath the existing ground, so that the pipe would be protected in case of cleaning or dredging. This installation required numerous fittings, relief valves and "around-the-clock" work.

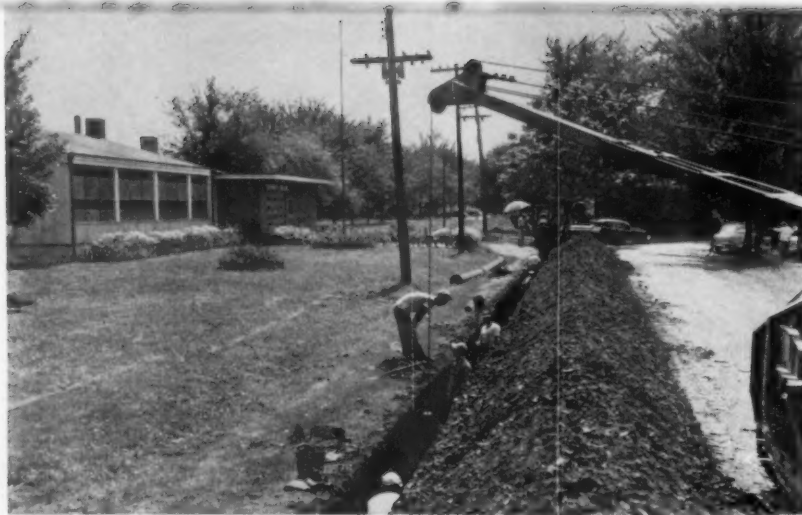
South of the canal the line followed an abandoned electric railway line right-of-way and also crossed the Missouri Pacific and Terminal Railroads. Finally, it is laid along a street in the Village of Dupu to the connection with Columbia's 10-inch main at the edge of Dupu.

The project was financed by issuing \$215,000 in water revenue bonds, maturing serially in 1953 through 1982. The good financial record of the city resulted in very favorable interest rates. Bonds maturing during the first 27 years bear interest at 2¾ percent and those maturing during the last three years a rate of 3 percent.

There were more than 750 water customers in 1952; and it is estimated there will be about 1,100 within 25 years. The total annual revenue of the water system, including hydrant rental, tapping fees, etc., on the basis of rates put into effect last year, will be about \$32,000. Operating expenses are about \$16,500 resulting in a gross operat-



● LAYING 12-inch line. Cost of this line averaged near \$6.35 per ft.



● LAYING 12-inch cast iron supply main 9 ft. under bottom of drainage canal.

ing profit which is more than the interest and principal payments on the bonds.

Priority regulations were still in effect when the project was started so the City decided to purchase the cast iron pipe, valves and fittings f.o.b. Bids were then received and a contract awarded for the construction of the line.

The cast iron pipe, fittings and gate valves cost about \$108,000. The construction contract for the installation complete was \$91,500. Breaking down these figures, the cost of installing the 28,200 feet of straight line averaged about \$6.35 per foot. The levee and canal crossing, 870 feet in length cost about \$11,200. Other items covered highway and railroad crossings, connections, meter box, etc. The total cost of the project, including legal engineering, easements and other costs, was about \$218,000.

The officials of Columbia wished to continue their cooperation with the neighboring City of Dupon so cross-connections were planned which permitted either City to supply the other in case of the failure of a supply main. There is a cross-connection north of the Dupon booster station so that Columbia can supply water to the Dupon booster. This is equipped with a meter and control valves. The original meter and connection used by Columbia at the South Dupon limits serve as an emergency connection so that Dupon can supply water to the Columbia line.

After the line was completed pressure and flow tests were conducted. The static pressure at Sugar Loaf, the highest point between Dupon and Columbia was about 50 pounds with normal pressure in the East St. Louis Water Company system. The line will deliver 300 gpm at the Columbia booster with a residual

pressure of about 30 pounds; about 475 gpm with a residual pressure of 10 pounds; or a maximum of about 550 gpm. In case of a bad fire the system will be able to deliver a flow of 1,000 gpm for a period of 11 hours, starting with the 300,000 gallon ground storage reservoir full and the supply line in operation.

The supply main should be adequate to take care of the needs of Columbia and vicinity for many years. Another example of foresighted planning was the purchase of a tract of land along the water line south of the canal at North Dupon for the future installation of a booster pump to increase the capacity of the line should there be unprecedented increases in the de-

mands for water in coming years.

A recent check of the water system operation showed that there are already over 850 water customers, a number not expected until 1957. This has resulted in an increase in net operating revenues so that the city has a surplus of over \$20,000 on hand. Should such a trend continue the city will have funds for further improvements of the system in the future, as these are needed.

On the basis of purchasing an average of 3 million gallons of water per month from the Water Company the cost of the water wholesale is approximately 16¢ per 1,000 gallons. As more water is used the average rate reduces. The only additional cost is the operation of the Columbia booster station and the maintenance of the water transmission line. Columbia therefore has a dependable and adequate source of water at very reasonable rates. The Water Company obtains its supply from the Mississippi River which is an inexhaustible source. Since the city has a signed long-term contract everyone feels that the water supply problem has been satisfactorily solved after a struggle of 25 years.

The city has been under the able guidance of Albert C. Metter, who has been Mayor of the City of Columbia for over 20 years. Fred Heise is Water Superintendent.

Incinerator Serves 12 Ohio Communities



HAMILTON COUNTY
INCINERATOR

● HAMILTON County incinerator, which was described in our February issue, page 124, serves twelve communities in Hamilton Co., Ohio. It was designed by Alfred LeFeber & Associates of Cincinnati.



An authoritative review of the latest design and construction methods which contribute to the performance of modern Portland cement concrete pavements



ADVANCES IN CONCRETE PAVEMENT Design and Construction

THE spotlight today is on heavy-duty road construction. Since the end of World War II and its years of critical materials shortages and stopgap maintenance and repair, increasing pressure has been brought to bear on new road construction—roads designed and built to high load-carrying capacities to meet vast increases in volumes and weights of traffic. The changing character of traffic has added to this pressure. For example, the number of trucks using our highways has doubled since World War II.

The emphasis on heavy-duty roads is reflected in legislation, planning and actual construction.

The Federal Aid Highway Act of 1954 signed by President Eisenhower in May of last year increased federal

The current national program of new highway construction has emphasized the need for heavy-duty pavements. Latest developments in concrete pavements are shown in this article, prepared by the Portland Cement Association.

authorizations to the states by some 52 percent over those provided by the 1952 Act. Authorizations for the Primary, Secondary and Urban systems each were increased 27.3 percent. But authorizations for the heavy-duty National System of Inter-state Highways were increased 600 percent.

This was followed two months later, in July, by announcement of the President's \$50 billion highway program. Since then, this program

has been more firmly crystallized, and again attention has been focused mainly on the Interstate System. In fact, about one-half of this proposed program is concerned with improvement of this vital 40,000-mile heavy-duty road network.

Undoubtedly, toll roads receive the greatest share of highway publicity, and their recent growth has been phenomenal. Turnpike data collected by the American Association of State Highway Officials and published in October, 1954, showed that approximately 44 percent of toll road mileage then in use had been opened to traffic within the past twelve months. A total of 1,152 miles of turnpike pavement had been built, and 5,147 miles were under construction, authorized, or

ready to be built to heavy-duty standards.

All of these things have fixed attention upon high-type paving materials and in particular upon concrete pavement, where new and relatively new advancements in technology, design and construction have added appreciably to service life and performance. Some of these developments, such as air-entrained concrete, are new today only to certain states and sections of the country where they have gained acceptance gradually. Other advancements, such as sawed joints, are catching on quickly. Still others, such as soil-cement sub-base for concrete pavement, have thus far found only limited application but are well worth mention because of their successful use and the possibility of further development, growth or acceptance.

Reviewed en masse, these and other advancements in concrete pavements form an impressive list, and help explain the confidence of engineers talking in terms of a service life of 50 years and more for a well-built heavy-duty concrete pavement. Their service value can be better appreciated when it is considered that road life studies reported at the 28th Annual Meeting of the Highway Research Board (1948) show an average useful service life of 28.2 years for concrete.

Air-Entrained Concrete

Air-entrained concrete, strictly speaking, is not new, having been discovered more than 15 years ago. But its use is still spreading. In 1947, some 12 states required its use. It was optional or permitted in 15 other states. Air-entrained concrete is currently specified by 32 state highway departments for all pavements and under some conditions by 11 others; and for many jobs by federal agencies.

Air-entrained concrete is produced through use of air-entraining portland cement (produced by grinding an air-entraining agent with normal cement clinker) or by addition of an air-entraining agent at the mixer. In either case, the soaplike resinous or fatty materials cause billions of microscopic bubbles to be produced in every cubic foot of the concrete. This air—about 3 to 6 percent of the concrete by volume for most pavements—imparts to the freshly mixed concrete its characteristic buttery look and workability. Evenly distributed throughout the concrete, the air cells relieve internal pressures on

the hardened concrete by providing minute chambers for the expansion of water when it freezes.

Air-entrained concrete was originally developed to prevent surface scaling due to excessive use of sodium chloride and calcium chloride for ice and snow removal. It is virtually immune to attack of such salts, and is highly resistant to severe frost action and cycles of wetting and drying and freezing and thawing. Experimental sections of highways located in five northeastern states subjected to severe exposure, heavy traffic and frequent application of chloride salts have proved this durability. A recent condition survey showed that while the average age of these sections was more than 12 years at the time, no scaling whatever had occurred on slabs made with air-entrained concrete. Other slabs



● AFTER 8 years, air-entrained concrete, right, shows no surface scaling.

showed varying degrees of scaling up to almost complete coverage.

Immunity of air-entrained concrete to scaling has also been proved in many famous highways, and of course in literally thousands of laboratory and field tests. It has already reduced surface maintenance costs. Future road life studies will undoubtedly show that it has been a great factor in extending appreciably the average useful service life of concrete pavements.

Virtually all expressways, turnpikes and other heavy-duty roads being built today have a few inches of well-compacted granular sub-base immediately beneath the pavement. This is a development which has come about almost entirely in the past decade; in fact, for the most part in the past few years. For example, on the original 160 miles of the Pennsylvania Turnpike begun in 1938, the design was for 9-in. reinforced concrete placed on the subgrade; whereas all later

extensions totaling 310 miles have called for an insulating course of a 6-in. granular subbase. The 17-mile long Colorado Turnpike from Denver to Boulder, completed in 1952, and the 241-mile Ohio Turnpike now under construction also have six inches of granular sub-base.

The trend to a few inches of sand, gravel or crushed stone beneath heavy-duty pavement was speeded considerably by results of Road Test I, Md., commonly called the Maryland Road Test, conducted in the summer and fall of 1950. In this test, a 1.1-mile portion of nine-year old concrete pavement in southeastern Maryland was divided into four test sections and subjected to six months of intense truck traffic.

In Section I, each truck had a single rear axle loaded to 18,000 lb. The 238,000 passes made by these trucks represented the number of similar axles which would normally use the road in 19.6 years. In Section II, axle loads of 22,400 lb. simulated 91 years of normal use. In Test Sections III and IV, tandem axle loads of 32,000 and 44,800 lb. were used. Twenty-eight of the slabs of the test road located in Sections I and II were built over a granular subbase similar to those now specified. The remainder of the slabs were located on a fine-grained plastic soil, below standard for today's primary roads. All three of the factors necessary for "pumping" were present, i. e., an excess of water, a subgrade of plastic soil or clay, and many repetitions of heavy weights.

In some sections located on plastic soil, "pumping" developed soon after the first heavy rainfall. The water infiltrated to the subgrade mostly from rutted shoulders neglected during the test. The impact of the heavy wheel loads of accelerated test traffic caused the weakened soil to squirt out at joints and edges of the pavement. This left portions without sufficient support, and some damage resulted.

But under more than 238,000 passes of the 18,000 and 22,400-lb. axle loads, all of the 28 slabs built on granular subbase remained in perfect condition. None was damaged.

Many engineers rank the prevention of pumping through the use of granular subbases one-two with air-entrained concrete as the most important contributions to the durability and performance of heavy-duty concrete pavements. Tests enable engineers to pre-determine



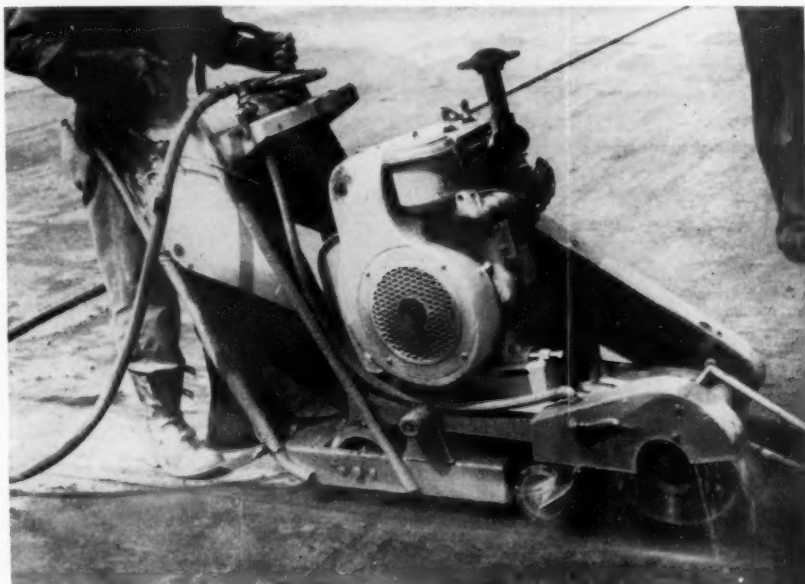
● **CONCRETE** paving slab on granular subbase was still in excellent condition when removed from Maryland Test Road after 238,000 truck passes over the slab.

whether or not a soil will pump, and to incorporate preventive designs.

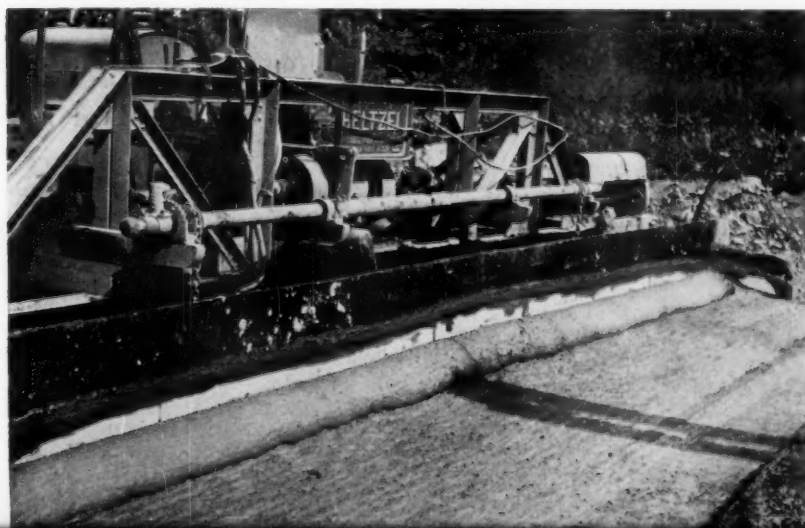
Sawed Joints

Since the first widespread use of sawed joints in 1949 in Kansas, this method for forming weakened plane joints in concrete pavements has been added to highway specifications by at least 14 states. Newly developed joint-cutting equipment has increased interest in the use of sawed joints, and the practice is catching on quickly.

The San Antonio Urban Expressway and the Hollywood Freeway are among heavy-duty roads with sawed joints. City streets in Omaha, Kansas City (Mo.) and Camden (N. J.) also include joints formed in this fashion, as do airport pavements at a good number of Naval Air Stations and Air Force Bases, Newark (N. J.) Municipal Airport,

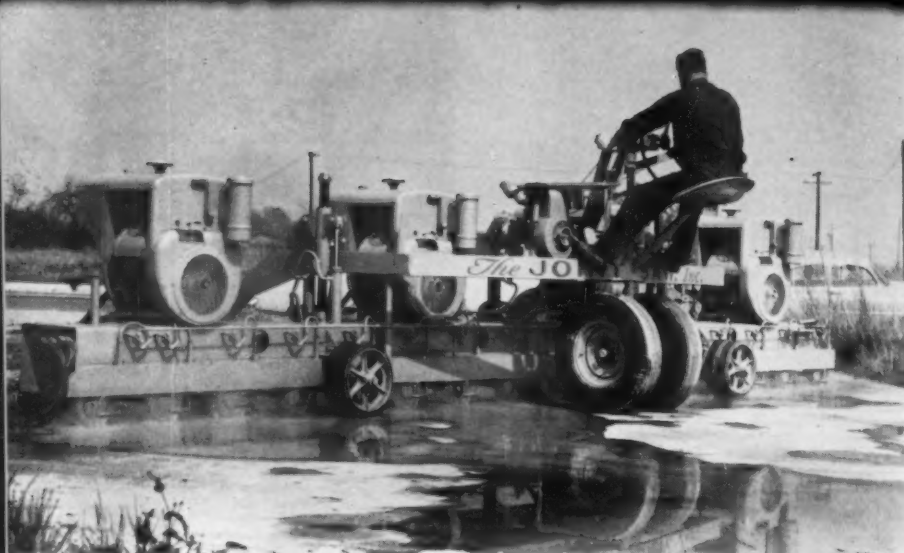


● **MAKING** a sawed joint. A single-bladed saw is pictured here with blade up to show how water under pressure is applied to the saw blade from a large water tank.



Saw blades generally used are circular metal disks made of "saw steel" with a diamond or silicon carbide cutting edge. They are made for "hard", "medium" and "soft" materials, e. g., terrazzo, concrete containing limestone or gravel, and green or slag concrete. Diamond-edged blades range in cost from about \$90 for 10-in. diameter blades to \$240 for 18-in. blades. Silicon carbide blades are lower in cost,

● **ROLL** ahead of finisher shows fatty, buttery appearance of air-entrained concrete freshly placed.



● **MULTIPLE-blade, self-propelled saws, such as this 16-blade machine, have mechanized concrete joint forming. A 25-ft. lane can be grooved in 40 seconds.**

but of course have a shorter service life.

Major uses of power saws have been for making transverse contraction joints, longitudinal center or hinged joints, and for repair work. They are also used for forming grooves at longitudinal construction joints to prevent surface spalling due to concrete overhang, and to provide a recess for joint-sealing material.

Use of a power saw in forming weakened plane transverse contraction joints offers many advantages. A smooth, uninterrupted concrete pavement can be placed, with a surface unbroken by high or low joints resulting from careless construction practices. The sawed groove is usually only $\frac{1}{8}$ in. wide, compared to $\frac{1}{4}$ in. for conventionally formed joints. This requires less sealing material, does away with the "thumps" made by vehicles passing over joints with wide openings or where an excessive amount of sealing material has been used; and prevents spalling. Sawed joints also pre-determine the location of cracking caused by contraction. The sawed groove is cut about one-sixth the thickness of the pavement, and causes shrinkage cracking to occur at these weakened points. Cracking from contraction at other points in the pavement is avoided, making the pavement less subject to water infiltration and reducing even further the possibility of "pumping" or freeze-thaw damage.

Experience with sawed joints shows that drivers like them because of a smoother ride. From an engineering standpoint, they can result in faster, more efficient construction of a better concrete pavement, requiring even less maintenance.



● **SAWED joint and resulting crack below the 2-inch deep groove is shown in this closeup view. Such joints almost entirely prevent cracking at other points.**

Another piece of rather spectacular concrete pavement construction equipment is the traveling form paver. Several such machines have been built embodying quite different details, and have created considerable interest in their potential use.

In brief, these pavers are single machines performing a great variety of paving operations. Complete with a spreader, finisher and float, and actually carrying their own "forms", traveling form pavers move down a prepared roadbed leaving a slab of concrete pavement behind.

As yet, these machines are not in mass production, but types are in use in Iowa and Illinois. They have proved best for secondary roads. Further refinement and development of these "all-in-one" pavers can be expected, as is now the case in the power saw field.

Uniform Pavement Thickness

Other advancements in concrete design and construction have come about slowly and without any great measure of publicity. An example is the trend to uniform pavement thicknesses.

In 1932, only eight states specified uniform thicknesses for concrete highways. Today, 40 states and the District of Columbia specify uniform thicknesses. Another five states make uniform design optional, and only two states still retain thickened edges.

The reason: today's roadbeds are wider, pavement lanes are broader, and greater attention is paid to provision of stable subbases. High-

ways of past years were built with thickened edges because on these narrow roads cars, trucks and wagons tended to "hug the outside" of the traffic lanes, and heavy wheel loads were frequently concentrated on the edges of the pavement. On today's wider highways, pneumatic-tired cars can stay nearer the center of their lanes, and thickened edge pavements are less necessary.

Soil-Cement Subbase

The growth both in use and variety of use of soil-cement has been phenomenal (see **PUBLIC WORKS** for December, 1953). In 1935, soil-cement was for the most part still an idea. In 1940, there was considerably less than 10 million sq. yd. in use. Today, more than 125,000,000 sq. yd. have been placed. Soil-

cement has been used for some 6,100 miles of rural highways and 2,200 miles of streets in more than 360 cities, towns and villages—plus airport pavement; reservoir and canal lining; embankment and dike slope paving; shoulder stabilization; and as subbase for heavy-duty highway pavements—to mention some uses. This growth has been spurred by experience records and condition surveys which have shown the material to be not only economical, but strongly resistant to freezing and thawing and excessive water conditions, and satisfactory in all types of climates, from Alaskan cold to Louisiana wetness. It has been used in 47 states.

An important, relatively new use of soil-cement is to improve and strengthen subgrades for concrete pavement. Since first significant experiments in 1948, the use of the material for subbases has gained increasing interest. More than two million square yards of soil-cement subbase were constructed in 1954 alone.

For the past several years, all concrete pavements built in California by the State Highway Department have had a four-inch soil-cement base course (termed "cement-treated subgrade" in California) specifically aimed at preventing possible pumping or faulting. Soil-cement subbases have also been built under expressways in Houston (Tex.) and in Oklahoma, where the purpose was to provide subgrades of low-volume change characteristics.

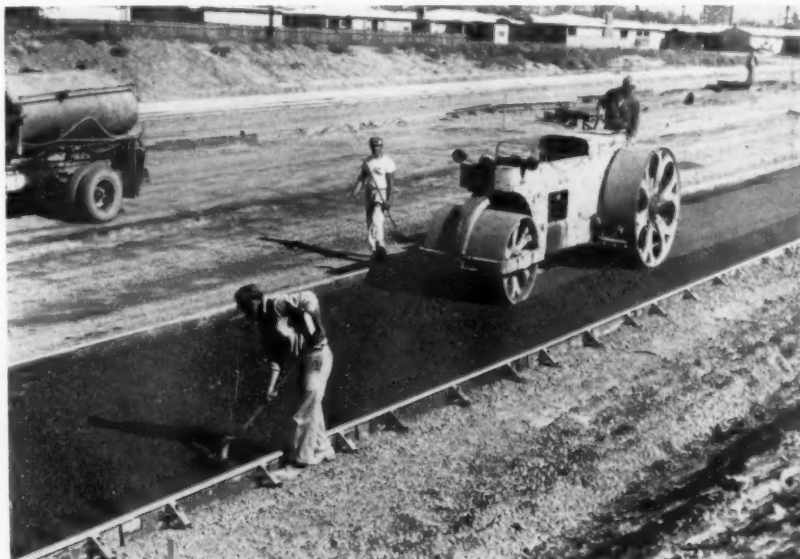
Two experimental projects to investigate subbase materials are being conducted in the Midwest, where soil-cement is studied along with open-textured and dense-graded granular subbase. In these two instances, soil-cement subgrades were built using very heavy clays existing at the sites.

Three factors make soil-cement subbases desirable: (1) the possible utilization of sub-standard granular material as subbase; (2) the economy of using existing soil on the site as subbase material; and (3) the possibility of better pavement performance resulting from the greater strength and uniformity inherent in soil-cement subbase. Dense and durable throughout, a soil-cement subbase resists erosion and moisture, and helps do away

● **MOTOR** grader has blade extensions which ride the forms. These are 12 ins. high allowing 8-in. concrete pavement on top of subbase.



● **BUILDING** 4-inch soil-cement base on Santa Ana Freeway, Calif. Here is the traveling mixer with loader, which picks up windrowed soil and cement. Water is added in the mixer and the soil-cement-water mixture is deposited as a windrow.



● **NEXT** step is spreading the mix between the forms. This is accomplished by spreader shown in the top photo. After the mix has been spread, it is compacted by the steel wheel roller shown in this photograph. The final step is shown below.



with troubles resulting from plastic, poorly drained, variable and unstable soils. As is true of granular subbase, it reduces maintenance, and experience will probably show that it adds years to the useful service life of pavements under which it has been placed.

In areas where soft, easily rutted shoulders are both a safety hazard and constant maintenance problem, soil-cement has been used successfully to reduce costs and improve-driving conditions. It has also been used in conjunction with concrete for road widening and for parking areas.

Progress in this field has been marked by development of new and improved construction equipment and procedures.

Separators, Reflecting Curbs

A relatively unique safety feature found on some concrete highways in Kansas, Tennessee, New Jersey, Illinois and other states is ribbed lane separators, usually made with white portland cement.

White cement mortar is used to top a two-foot wide concrete strip between parallel lanes on a highway, where it acts as a permanent lane separator or marker.

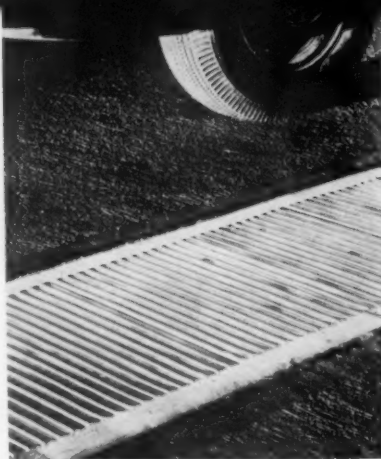
The surface of the strip is scored with a grooving device. In addition to reflecting car headlights, the scored separator sings out a warning to motorists when vehicle wheels get out of their lanes. The separators cut down on lane "drifters", speed up passing, and help to channelize traffic.

In New Jersey, white portland cement has been used in construction of light-reflecting curbs as well as separators. In Tennessee, darker colored concrete has been used to contrast with lighter-colored concrete of highways.

One of the best liked characteristics of concrete is its high night-time visibility. Because of this, the potentialities of white portland cement for concrete posts, guard railings, median strips, etc., where even higher visibility is desired, are frequently used.

Precast, Prestressed Uses

The first prestressed concrete bridge in the United States was completed in late 1950, in Madison County, Tenn. The first major



● **SCORING** effect on white portland cement concrete lane separators or traffic markers. Corrugations are made with hand scoring equipment.

prestressed bridge in this country was opened only four years ago, when the Walnut Lane Bridge was completed in Philadelphia.

Since that time, approximately 50,000 feet of prestressed concrete bridges have been built in the United States. More than 21,000 ft. were constructed in 1954 alone—17,424 ft. being used in the Tampa Bay Bridge from St. Petersburg to Tampa, Fla.

Prestressed concrete is being used in other big projects now under construction. For example, a 240-

PUBLIC WORKS for March, 1955

ft. twin span crossing the Klickitat River about 30 miles northwest of Goldendale (Wash.) will be the longest such span in the western United States when completed.

Prestressing has definitely entered the highway field, where it has opened up new design avenues and, through precasting, has made possible speedy construction of lower-cost bridge structures. The possibilities of the material have not yet been fully exploited in this country, but much progress is being made. A recent big prestressed project was the construction of twelve prestressed concrete bridges on the Garden State Parkway, New Jersey.

The bridges, with spans varying from 39 to 60 ft. in length, were built of 218 prestressed beams fabricated in a precasting factory.

Prestressing, by allowing architects and engineers to design and build lighter, shallower structures where these qualities are needed, without sacrifice of strength, appeals to designers. Because prestressing permits building of longer unsupported spans than ever before, highway bridge engineers can eliminate the center abutment in many over-



● **STEEL** tendons are being placed for one of the thirteen 160-ft. pre-stressed concrete girders for the Walnut Lane Bridge in Philadelphia.



● WALNUT Lane Bridge, another view, showing the 160-ft. center span. Opened early in 1951, it was the first large pre-stressed concrete bridge in the USA.

pass structures and in relatively short span bridges. This can result in safer highways, as well as a lowering in cost over conventional construction. The Illinois Highway Department, for example, has shown preference for prestressed concrete where its use can eliminate center support columns.

Utilization of precasting methods to prestressed construction may contribute greatly to its spread in this country.

For several years, railroads have made use of precasting yards to produce bridge members, piles, complete bridge decks, etc., which can be shipped to a building site on short notice. In some instances, bridges have been replaced without interruption of service. In one instance, nearly 70 miles of precast concrete piles were used by a railroad in the construction of a single large pier near Norfolk, Va. This technique has been extended to highway and street bridges, and is gaining in popularity. In the case of the Garden State Parkway, for example, precast prestressed construction allowed traffic to be maintained over heavily traveled roads without detours.

With more than 8,000 bridges on the National System of Interstate Highways deemed below standard in a survey conducted by the U. S. Bureau of Public Roads, semi-standardization and use of precast and precast prestressed techniques may prove to be the answer. This is the system upon which emphasis is placed by the Federal government in the Federal Aid Highway Act of

1954 and in the President's proposed \$50 billion highway program.

And in the Future—Perhaps

In France and England experiments have been underway for about five years in prestressed concrete highway slabs.

British engineers report that prestressed highway slabs have a higher load-carrying capacity than conventional reinforced pavement, and "consequently a thinner slab can be used for a given loading."

In the latest British experiment at Basildon, the concrete slabs were cast on waterproof paper. Lengths

of pipe were pulled forward as the concrete set, leaving holes for insertion of prestressing cables.

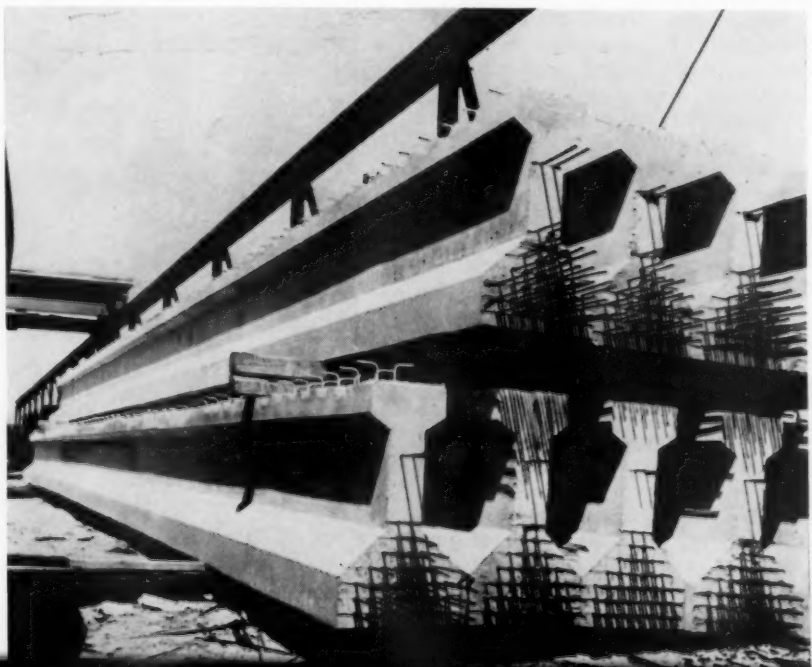
The Cement and Concrete Association of London figures that prestressed slabs up to 400 ft. in length can be laid economically. The problem has been to develop an efficient and durable expansion joint.

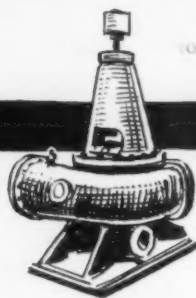
The European experiments in prestressed concrete highway slabs have used both pre-tensioning and post-tensioning methods.

While these experiments may seem somewhat far-fetched to American roadbuilders today, it is precisely the combined factors of high load-carrying capacity and economy that have resulted in concrete's eminence in the heavy-duty paving field.

With the great amount of money scheduled and proposed for highway construction in the near future, it appears that for the first time there will be adequate funds to build the best possible highways from the beginning, heavy-duty highways that can take today's traffic, and tomorrow's, too. The overall increase in federal funds should have the salutary effect of allowing state highway and street planning on a high, long-range level. It will permit engineers to plan and select pavement on the basis of adequate load-carrying capacity. In such highway development, concrete is certain to play a major role, and even the most recent advancements in concrete construction may soon become established practice.

● STOCKPILE of pretensioned concrete beams for use in the 12 prestressed concrete bridges on New Jersey's Garden State Parkway. These prestressed beams are 58 ft. long and contain 40 strands of $\frac{3}{8}$ -in. steel wire. Prestressing permits longer spans.





NEW PUMPS USE LESS POWER TO HANDLE SEWAGE FLOW

M. H. KINSINGER,

Chief Mechanical Superintendent,

District of Columbia

Sewer Operations Division

WHEN THE District of Columbia's Sewer Operations Division installed three 15,000-gpm Fairbanks-Morse vertical angleflow pumps at its Rock Creek Pumping Station in 1952, its chief purpose was to increase the station's capacity to 64.8 mgd. A steadily increasing volume of unscreened sewage and storm water was coming in from the surrounding District and from nearby Maryland and the station's current peak of 30 mgd was expected to reach an eventual 60 mgd.

Since they were installed, however, the three pumps have not only solved this pressing load problem, but they have cut operating time at the station by 46 percent and electricity costs by 11 percent. Power consumption per million gallons of sewage pumped has dropped from 108.17 kilowatt hours in 1951 to 80.21 kwh in 1953, a reduction of almost 26 percent.

These figures are based on the station's log sheets for 1951, the last full year of operation with the old 12-in. 8,000-gpm sewage pumps, and on the log sheets for 1953, the first full year of operation with the new 24-in. angleflow pumps, each of which is rated at 15,000 gpm at a total dynamic head of 18 feet. In 1951, the old 12-in. pumps handled a total of 5,092.7 mg of unscreened sewage and storm water

in a total running time of 626,577 minutes. In doing so, they consumed a total of 550,881 kwh. at an average rate of 108.17/kwh/mg pumped. In 1953, on the other hand, the three new Fairbanks-Morse pumps handled 5,799.7 mg of sewage in a total of 386,643 minutes. Thus, they pumped 13.8 percent more sewage in 45.8 percent less time than the older units would have required to handle the same load. In doing so, they consumed only 465,200 kwh. of electricity at an average rate of 80.21 kwh./mg pumped, a decrease in power consumption of 25.8 percent.

In 1951, the average power cost was \$1.69 per mg pumped. In 1953, on the other hand, the average power cost was only \$1.50 per mg.

This reflects a cost reduction of more than 11 percent, or \$1,099.61, by the new pumps in their first year of operation. In other words, it cost practically no more to pump the increased flow of sewage because of the greater efficiency of the new pumps and, in addition, the pumps provide needed capacity.

These savings should increase as the pumping volume at the station increases. The reason for this is that the Rock Creek Station is currently paying a higher average rate per kwh than it did in 1951, due to increased demand charges for its larger units. In 1951, when the peak demand at the station was 117.7 kw., the average cost per kilowatt hour was 15.6 mills. In 1953, when peak demand climbed to 230.4



● **ROCK CREEK** Pumping Station in Washington, D.C., exterior view. In this station are three 15,000 GPM vertical F-M Angleflow pumps. Total capacity is 64.8 MGD.

kw., the average cost jumped to 18.7 mills per kilowatt hour.

Future Loadings

As the sewage load at the station increases in the future, power demand and attendant charges should increase only slightly, if at all. The higher volume can be handled simply by increasing the running time of the present units. On the other hand, as kilowatt hour consumption at the station climbs above the 50,000 mark, the station will pay \$.00285 per kwh. less for all energy in excess of that amount, adding to the cash savings already introduced by the new pumps. The 46 percent reduction in running time made possible by the new larger Fairbanks-Morse pumps is also expected to result in substantial savings, both in lower maintenance costs and in longer service life for the new equipment.

The 13.8 percent increase in the volume of sewage handled at the Rock Creek Station is about what was expected after 16 months of operation, with present design figures not expected to be reached for approximately 25 years.

As has already been stated, the original problem at this station was to increase its pumping capacity to handle the steadily rising flow of sewage and storm water with as few major structural changes as possible. Estimates were that the capacity of the incoming sewer was about 30 mgd. With structural changes, it was felt that maximum peaks as high as 60 mgd. might be produced. Therefore, in deciding upon the size of pumps needed, an arbitrary figure of 15,000 gpm for each pump was selected. In this way, two such pumps could handle the present maximum flow and three pumps could handle the maximum flow expected for many years. Such an arrangement would also provide a spare unit, ready to go into operation in the event of an emergency.

The specifications called for three vertical angleflow or mixed flow pumps to handle unscreened sewage and storm water, each to have a capacity of 15,000 gpm at a TDH of 18 feet and to operate at a speed of approximately 500 rpm. The minimum head was specified at 10 feet and the maximum head at 24 feet, with a shut-off head at not less than 30 feet. The specified efficiency was 80 percent and each pump had to be capable of passing 9-in. spheres. Pumps, motors, shafting, motor starters, capacitors and switchboard were all included in

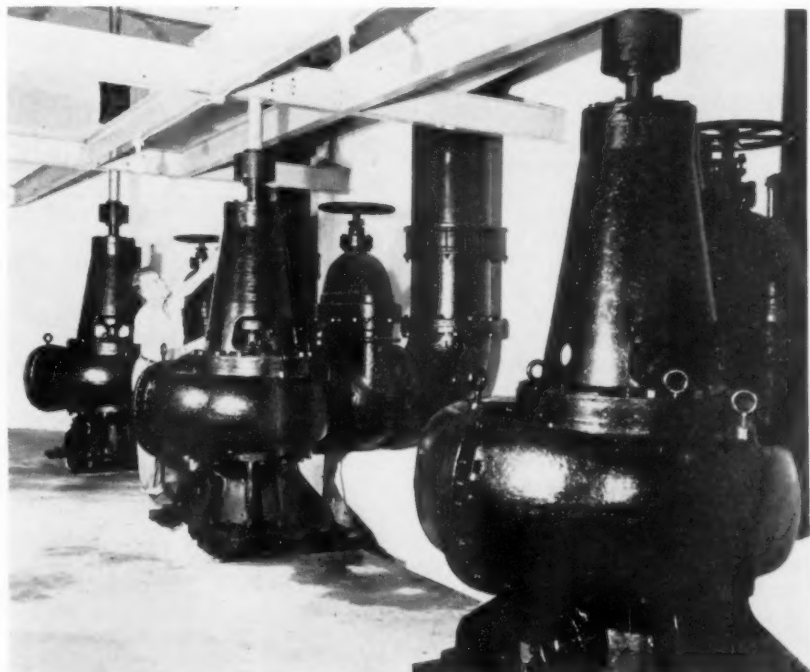
the one bid, which was awarded to Fairbanks-Morse & Co. The three pumps selected were FM Fig. 5710, angleflow units, driven through vertical solid shafts by 100-hp., 499 rpm, Type QZKU, 3-phase, 60-cycle, 208-v F-M induction motors.

The Rock Creek Station is subject to possible flooding during flood stages in the nearby Potomac River, and to provide for this the motor floor is located about 30 ft. above the pump room floor. In installing the new pumps, solid steel shafts measuring 20 ft. 9 in. in length and 3 15/16 ins. in diameter were used, with each shaft provided with three intermediate steady bearings and with a flexible coupling at the pump end. The lower seven feet

lines. It was feared that cutting through the sides of the chase might create serious ground water problems. The bottom of the wet well and the pump room floor are on the same level at this station, so, to solve the problem, it was decided to run the 24-in. suction lines directly through the wall and have the suction entrance on a vertical instead of a horizontal plane. A concrete deck was then laid over the pipes and two levels were created in the pump room.

At the same time a 45° elbow was fitted on the wet-well end of each suction pipe to lower the level at which pumps would pull air and lose suction.

Since the Rock Creek Station is



● POWER consumption has been cut 15 percent by these modern 24-in. pumps.

of each shaft was made into a removable section, using a compression coupling, thus permitting the individual pumps to be repaired without removing their motors or the main sections of the intermediate shafts or guide bearings.

Structural Problems

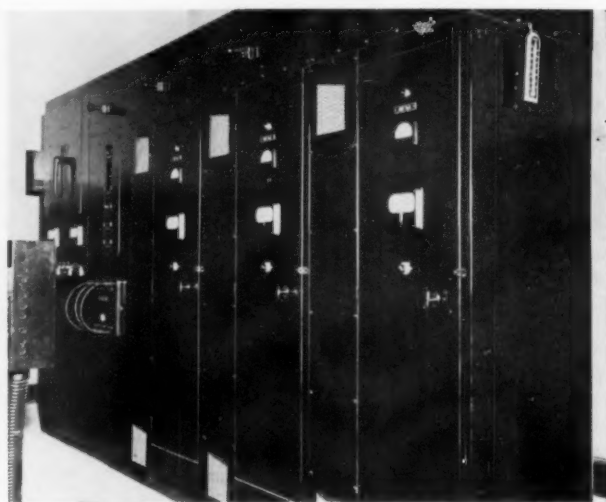
Several structural problems arose in these early stages of planning and installation. One was the fact that the existing 14-in. suction lines serving the old pumps were laid in a chase under the wet well and pump room floors. When it was decided to install the larger units, this chase was found to be too small to accommodate the 24-in.

subject to flooding, the creation of two levels in the pump room solved another problem. The lower level was connected to the pump well and a 300-gpm. trash pump, operating at a TDH of 29 ft., was installed to handle unusual drainage due to flood infiltration or other causes. Drainage beyond the capacity of the sump pump is permitted to back up, using the lower pump room level as a reservoir and the float control on the trash pump puts the pump in service as needed. Ordinary leakage is confined to the sump well and is handled by an automatic sump pump rated at 2400 gph. at a TDH of 15 feet.

It was considered desirable to install a five-ton hoist in the station



● MOTOR room, 10 ft. below the surface of the ground, contains the three 100-hp, 499-rpm F-M induction motors.



● SWITCHBOARD: Motor control panels in the foreground; note the three plugs closing circuits in automatic control.

in order to handle the heavier pieces of equipment. The problem of providing adequate support for such a hoist arose, however, when it was found that the station's roof beams were not heavy enough to sustain a load of this magnitude. The Municipal Architects Office was then called in and a truss suspension was designed across pairs of roof beams, providing more than adequate support and at the same time limiting the loss of head room. It has worked out very well.

Since the Rock Creek Pumping Station is automatically operated, as simple and as foolproof a control system as possible was installed for the three new pumps. Starting and stopping each unit is accomplished automatically through the use of three floats in the wet well. The first float is set at a predetermined level, the second float one foot above that, and the third one foot above the second. These three floats are then connected to three plug caps, suspended on the ends of short cords at the front of the switchboard. Any sequence of pump operation can thus be obtained by simply inserting the plug caps in the desired motor-control receptacles, also located on the front of the switchboard.

Although two of the 15,000-gpm. pumps can handle the present maximum flow, all three are available for service in the event of an emergency. The wisdom of this arrangement was demonstrated recently when, with two of the pumps running, an emergency caused a sudden temporary overload. The pump's circuit breaker immediately tripped out and the level in the wet well began to rise. In less than two minutes the third pump automati-

cally replaced the tripped out unit and pulled the wet-well level down to normal. The two pumps then continued to handle the load until the next day, when maintenance men corrected the trouble and restored all three units to service.

Another feature incorporated in the station's switchboard is a time recycling device. In the event of a power failure, the level in the wet well would probably rise high enough to trip all three float switches, causing all three pumps to start up together as soon as power was restored. To prevent this possibility, which would almost certainly trip the line circuit breaker on the switchboard and leave the station out of service even though power had been restored, the time recycling device delays the start of the first pump 10 seconds, permitting any auxiliaries which might have been running to get back on the line first. Then, 15 seconds later, the second unit is started up, followed by the third unit 15 seconds after that. In this way normal operations are restored without further difficulty.

Electronic level transmitters have been installed on the suction and discharge with both levels recorded on a single chart near the switchboard. This gives a clear picture of what is happening in both sewers as a result of pump operation and also gives the actual water-to-water lift in the station. Each pump is equipped with a timer and a counter, both of which are mounted on the switchboard control panel with the pump starter. The timer gives the minutes of operation and the counter gives the number of starts. This information as well as the kilowatt

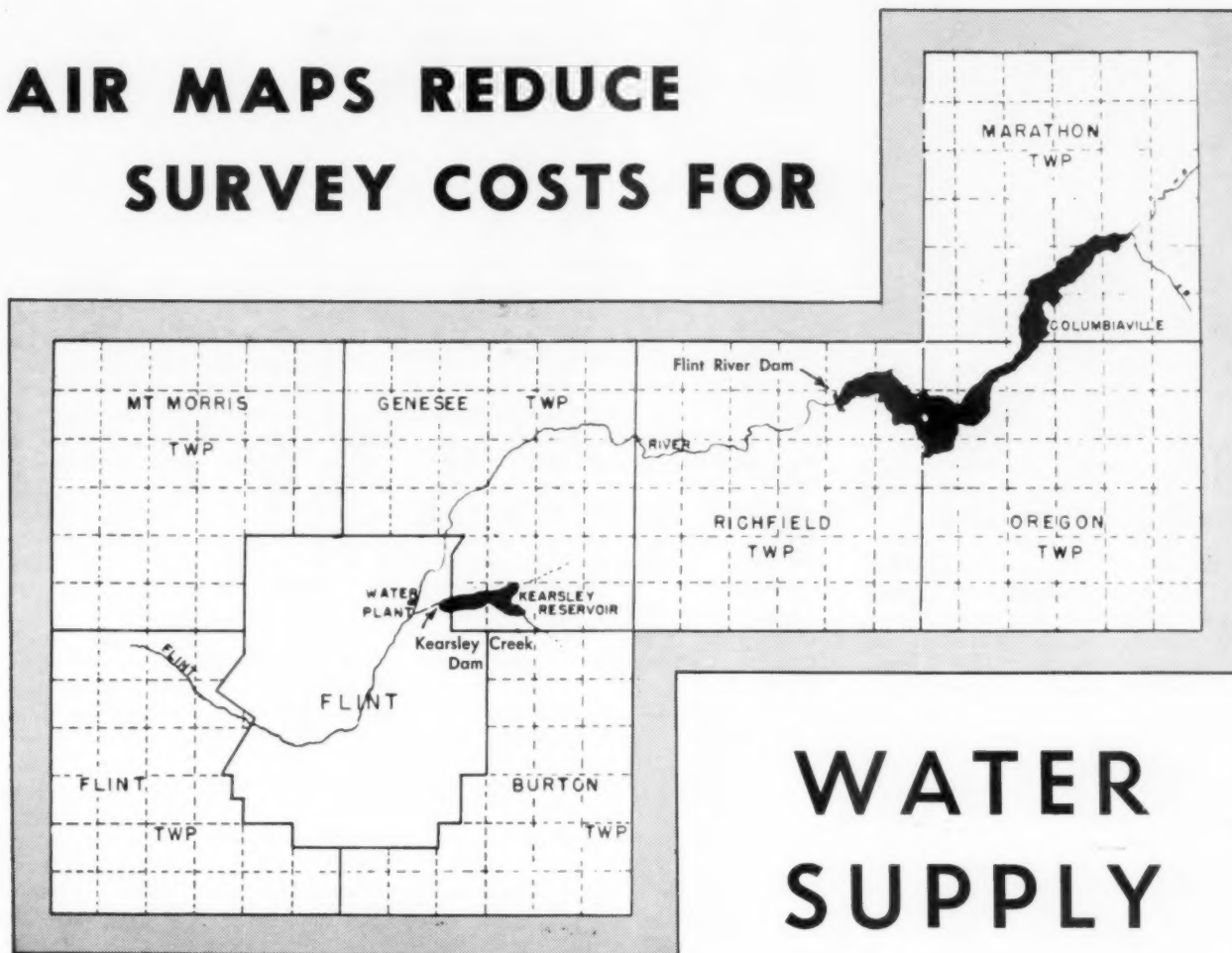
hours used is then recorded on a log sheet by the maintenance man when he visits the station. This level chart and log sheet give the office enough data to analyze operation and costs.

The entire job from planning to installation was handled by the regular maintenance and repair employees of the District of Columbia's Sewer Operations Division, with some assistance from the Municipal Architects Office in planning structural changes. Structural changes, design of equipment, specifications, mechanical and piping layout, and electrical wiring were all planned and followed through in detail by the Chief Mechanical Superintendent and his assistant. The actual work was performed by machinists, electricians and laborers under the direct supervision of the Machinist Foreman, who ran the job, and the Electrical Foreman, who supervised the electrical work.

By handling the job in this manner, three distinct goals were achieved. First, since the station had to be kept in service during the remodeling, it was easier to delay or postpone work which interfered with operation than it would have been if a general contract had been let. Second, since the men who installed the equipment are the same men who will have to maintain it, the additional knowledge they have gained will prove invaluable to them in their later work. And lastly, a very substantial saving was returned to the District of Columbia. The efficiency of the new equipment has returned additional savings in operating cost per million gallons pumped and all signs indicate even greater economies in the future.



AIR MAPS REDUCE SURVEY COSTS FOR

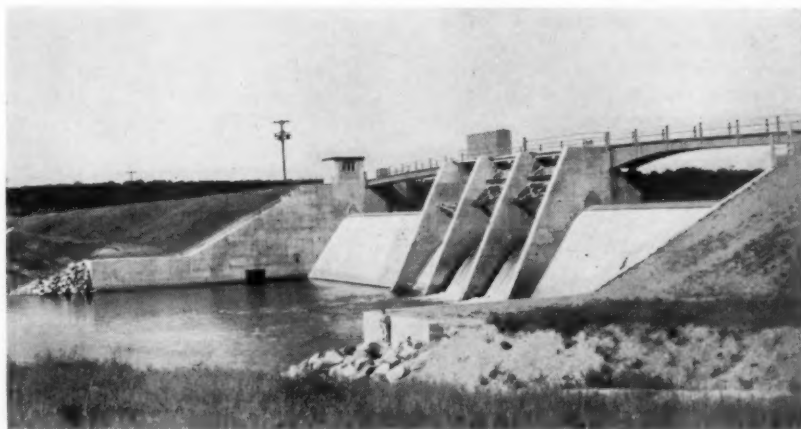


WATER SUPPLY

THE NEW water conservation project at Flint, Mich., had finished its first full year of operation at the end of 1954. The year was a complete success: The \$2 million dam and reservoir, which stores water from the 40-foot wide, knee-deep Flint River, successfully supplied the busy industrial center of 175,000 population through a year when water shortages had plagued communities across the nation.

Construction of this dam, starting two years ago, was not entirely a gamble. The idea was originally conceived in 1924. A topographic survey of the broad, shallow valley was started but abandoned when mounting costs indicated the complete survey would take much of the money available. Attention was then focused on the nearby Kearsley Creek which empties into the Flint River at the edge of the city. A dam was built on the Kearsley in 1929 and has served well, impounding 650 million gallons.

But, with the rapid expansion of the community during the war and post war years, it was apparent that a greater supply must be



● FLINT River dam in operation. Two Tainter gates at right are open. One of the sluice gate outlets is shown at the left. Above is map showing watershed area.

sought. A glance toward Lake Huron, 65 miles away, suggested the solution, and this is still the ultimate aim, but costly. An interim solution, the damming of the Flint River, seemed to be the answer for the immediate future.

A check of finances indicated \$1.5 million could be raised on a bond issue and plans for a dam 10 miles

above the city were outlined. The cost of the topographic survey again appeared at an almost forbidding figure. But since the 1924 plans were given up because of survey costs, accurate aerial survey methods had been perfected and the newer and less costly method was chosen. Flint officials say that, without the cost-saving



● KEARSLEY Dam, see map on page 97, showing flow in creek below dam.

aerial mapping of the area, a dam of the needed capacity could not have been built with the money available.

The Army Corps of Engineers joined in the project and ordered an air survey of the adjacent area upstream to study the effects of higher water on the property owners and communities above. Both surveys were made in 1947 by Abrams Aerial Survey Corporation of Lansing, Michigan.

While the dam is designed to raise the water of the little stream 28 feet and create a lake ten miles long and a half mile wide, lack of rainfall in 1954 and the drain on it during the summer, made it possible to raise the water level only 18 feet. Winter snows and spring rains are expected to bring the water level to the planned 28 feet in 1955.

The city bought more than 2,000 acres of land, most of which was flooded for the project; and, incidentally, it acquired a new problem yet to be solved. That is whether the valley and the artificial lake can assume the status of a recreational area. Abutting land values have already increased and a few boats and fishermen have appeared without interference but Flint officials say that they have not yet explored the possibilities in the legal, economic and social areas in which the problem falls.

The new dam will store 5,760 million gallons of water and, with the old Kearsley reservoir, there will be available 6,410 million gallons of water, enough to supply the city for nearly a year at maximum consumption even should the stream go dry completely.

In addition to supplying the city with water, the dams assure the city a constant river flow to carry away the discharge from the sewage disposal plant below the city. The Kearsley water level was low-

ered once during the past season to flush out the slow-moving, near-stagnant water below it during the summer dry spell. The city's water pumping station is, of course, upstream. Here the water is taken from the lake, pumped into a clear water reservoir, treated and supplied to the city mains.

The Flint River dam consists of an earth filled dike a half mile long, with a center controlled section 240 feet wide, its top 40 feet above the old river. The controlled section is made up of three 20-foot Tainter gates which may be set individually at two fixed heights with a variation of four feet; at each side are two 90-foot floating drum gates which automatically rise with the water or can be lowered by flooding of the flotation chambers. There is a sluice gate at each side of the center section which allows fine control of the flow. These can be used in conjunction with the other gates and allow drainage of the reservoir.

The population served by the Flint water works is presently es-

timated at 175,000 but because of large industrial plants served, the water demand is in the high range: 199 gallons per capita per day during 1953. Flint estimates 85 percent goes to industry.

A peak demand in July, 1954, required pumping for one hour at the rate of 92.5 million gallons per day, a real test for the facilities. During that month 1,555,660,000 gallons of water was supplied to the city.

In October, 1954, the reservoir was emptied to check the condition of the dam after a year's service. While the engineers feel the entire reserve of water could be released in one week and would like to have done some experimenting in the matter, bridge work in town precluded the release of quantities of water and the reservoir was allowed to drain out gradually during the month.

The Water Conservation Bond issue is scheduled to be retired in 20 years at which time population growth surveys indicate a line must be run to Lake Huron.

Winter Grading Work in Maine

THE normal working construction season is not very long in Maine and every effort must be made to extend it wherever possible. District No. 7, with headquarters at Fryeburg, had the job of doing the grading and preparing the sub-base for a new four-mile improvement on Route 5 and Route 113 between Fryeburg and Brownfield, Maine.

A February thaw made it possible to begin the grading and leveling of the heavy gravel sub-base with an Allis-Chalmers motor grader. Thus the preliminary work was done in the winter so that actual paving operations could begin early.

In addition to this job the motor grader is used for gravel mainte-

nance, shoulder maintenance, tar mixing, patch mixing, grading, ditching and snow removal on the 250 mile area of this district.

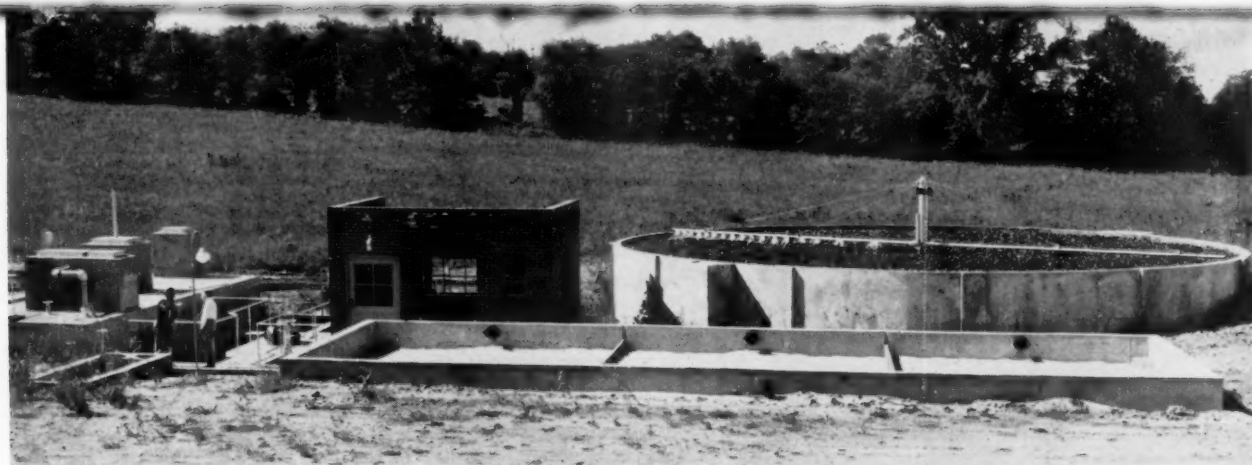
Standby Power for a Sewage Treatment Plant

SEWAGE treatment is a function that must go on for 24 hours every day in the year. In most plants a power failure could be disastrous, with a tremendous rehabilitation and clean-up job necessary. To



guard against such an emergency, Sheboygan, Wisc., many years ago installed this 10 kw Kohler generator. It provides power for lighting, for other vital operations and for the master control panel and recording instruments. It has automatic starting.





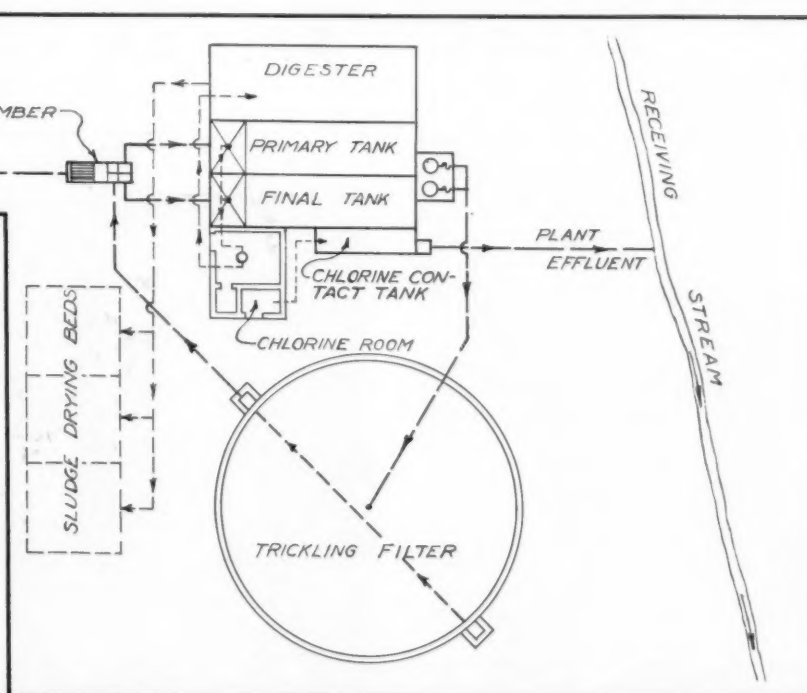
SEWAGE TREATMENT FOR A MANUFACTURING PLANT

EDWIN B. WAGNER

Sanitary Engineer, Downingtown, Pa.

TO PROVIDE for the sewage and other waste flows from the new manufacturing plant of the Autocar Division of the White Motor Co., a modern treatment plant was constructed which has several unusual features. The new plant is at Exton, Pa. The main building, which is 200 ft. wide and 650 ft. long, is on a 54-acre tract through which a small stream or "spring ditch" flows before it empties into a trout stream.

On account of the size and character of the receiving stream, all units were over designed, the design population figure being set at 750 persons. The sewage flows from the manufacturing plant to a screen chamber and through the primary settling tanks by gravity; is pumped to the trickling filter and flows back to the screen chamber with a return that can be diverted to the primary or secondary tank or divided between the two. Time of completion being a consideration, the design was made as simple as possible. The primary, secondary and digestion tanks were built on one common floor level.



● UNUSUAL features are incorporated in this small sewage treatment plant.

The sidewalls of the trickling filter were built of pre-cast concrete segments, each segment being 12 feet in length, eight feet in height and eight inches in thickness. Horizontal reinforcement was extended through the ends of the segments and two vertical rods at each end of the segment were extended through the side to provide hooks for setting them. The segments were cast horizontal and set on prepared foundations with a crane. The horizontal rods from each section were welded together and the space between the segments was poured with concrete. The rods used for setting

were burnt off even with the concrete. Both the primary and secondary tanks were provided with one longitudinal and two cross effluent troughs, the two cross troughs having adjustable weir plates.

All the mechanical equipment was supplied by the Link-Belt Company of Colmar, Pennsylvania. The pumps were furnished by the Chicago Pump Company and the trickling filter distributor was provided by the Pacific Flush Tank Company.

The treatment plant is situated about 600 feet from the main assembly plant and the dimensions

of the various parts of the plant present a picture of its capacity. The primary settling tank is of the Dallas type, 35 feet long and eight feet wide with an average depth of six feet. It has a single hopper five feet deep, giving a total depth at the hopper of 13 feet. The secondary tank is the same size. The circular trickling filter is 50 feet in diameter and six feet deep.

The filter contains about 600 tons of $1\frac{1}{2}$ to 3-inch crushed stone. Underdrains are of vitrified clay and a tile center channel collects

the flow from the underdrains and directs it to the secondary settling tank, or to the screen chamber and primary settling tank, in whole or in part, as desired.

The rectangular digestion tank has Link-Belt equipment. Sludge from the settling process is pumped to the digester, which is 29 ft. long, 14 ft. wide and 9 to 13 ft. deep, completely enclosed, with only a man-hole for access. After digestion, the sludge is pumped to open drying beds 48 ft. long and 16 ft. wide. These have 5-inch vitrified clay

underdrains covered with 12 ins. of $\frac{3}{4}$ -in. crushed stone, 6 ins. of $\frac{1}{4}$ -in. gravel and 9 ins. of coarse sand.

The plant effluent, after final settling, is chlorinated before discharge.

All of the control valves, pumps, agitators and chlorinating equipment are located compactly in a concrete floored brick building in the center of the area.

Daily tests are made of the effluent going into the stream for residual chlorine content, for relative stability and for amount of settleable solids.

MERCURY VAPOR LIGHTS PROTECT BRIDGE APPROACH

C. E. WRIGHT

HIGH intensity lighting, automatically controlled by the amount of daylight, has been used with excellent results on the western approach to the Mathews bridge, a part of the \$60,000,000 expressway system now being built at Jacksonville, Fla.

The new lights are of the mercury vapor type, the first of their type to be installed on Jacksonville highways. J. Dillon Kennedy, city utilities commissioner of Jacksonville, whose department installed the lights, credits the high intensity lighting with making the bridge approach more accident-free.

Feeder streets which lead into the highway system are lighted by incandescent luminaires. As these give off a white light and the mercury vapor lamps a blue light, it is believed also that the difference has made it easier for visitors to keep on the expressway. The expressway lights are mounted on aluminum alloy poles which will require no painting.

The automatic turning on and off of the lights has operated satisfactorily. Near sundown when the amount of daylight decreases to a specified level the lights automatically come on and stay on until daylight increases in the morning to a specified level.

Almost since its opening the Mathews bridge, a \$12,000,000 high-



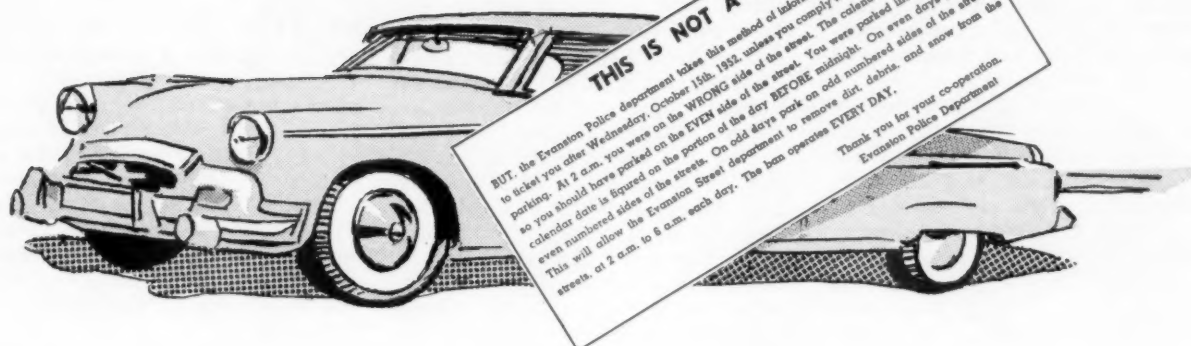
● MERCURY vapor lights on Jacksonville Expressway have reduced accidents. Automatic controls turn lights off and on according to specified daylight level.

level structure, which permits a bypass of much of the central city, has been averaging about 15,000 vehicles a day. While most of this is daytime traffic, there is also a heavy flow after dark. The nighttime traffic flow has been made smoother by the brilliant lighting.

Little trouble has been encountered in the operation of the light-

ing system. There are five circuits, each operating independently of the others, so that the failure of one circuit does not shut off the others.

The lighting system was designed by the city's engineering consultants, Reynolds, Smith & Hills. Lamps were furnished by the Westinghouse Electric Corp. and standards by the Union Metal Co.



STREET CLEANING EXPEDITED by One-Side Parking

PHIL HIRSCH

PARKED CARS, a frequent headache in municipal street cleaning operations seldom bother the crews in Evanston, Ill., whose work is greatly expedited thanks to an ordinance which requires motorists to park on alternate sides of the street each night.

Before the measure was passed, debris often accumulated to a depth of three or four inches in some places. Near the central business district, for example, are choice parking spots which were constantly occupied when the street cleaning crews came by. A similar problem was created by some residents, whose working hours were such that they happened to be home in the morning, with their cars parked at the curb, when the crews came by. In a situation like this it was necessary to pass by the spot. Not only did the quality of street cleaning operations suffer, but the work was slowed because of the need for navigating equipment around the obstacle.

In many cases autos were parked near, or over, sewers. The inability of street crews to clean these spots often resulted in clogged drains

after a rainstorm. The city was then put to additional expense sending men and materials out to get the sewer functioning again.

These troubles have been sharply reduced by the new ordinance. Before it was passed, the crews were lucky if they cleaned 15 gutter miles per day. Today, that figure is about 25 miles.

Before the "opposite side of the street" ordinance was passed, signs were posted along thoroughfares to be cleaned asking motorists to remove their vehicles. The cardboard no-parking placards were stapled to wooden lath or to trees, or were tied around street light standards. But this system was far from perfect. Many motorists failed to heed the warnings. In apartment districts, where use of on-street parking

spaces is particularly intensive, it was necessary for one or two police squads of one or two men each to accompany the crews.

When an illegally parked vehicle was encountered, police would trace the owner through his license number, then phone and ask him to get the vehicle out of the way. If the vehicle wasn't removed, or the owner couldn't be located, a tow truck was called to move the vehicle out of the path of the street sweeper. All these preliminary efforts slowed down the sweeping operation considerably.

Posting the signs and taking them down required additional manpower and equipment. This job was handled by a four-man crew using two trucks. The crew included two employees from the department of



● SWEEPER has dumped a load and is ready to start again. Control of parked cars enables street division to clean 25 gutter miles per night.

public works whose regular work involved barricade erection, dead-animal removal, and similar emergencies, aided by two workers from the street division.

Now, the special police squads and the four-man sign crew no longer have to be used for street cleaning operations. And streets in apartment districts are cleaned in about one-fourth the time formerly required.

The heart of the ordinance that has brought about these manpower savings is a provision which reads: "It shall be unlawful for any person, firm, or corporation to stop, stand, or park a vehicle, or to cause, or permit a vehicle to be parked, or left unattended, between the hours of 2 a.m. and 6 a.m. of any day, except (if) the vehicle (is) parked on the even-numbered side of the street on those nights bearing an even-numbered calendar date, and on the odd-numbered side of the street on those nights bearing an odd-numbered calendar date."

The date referred to in the ordinance is the one covering the period before midnight. Taxis and emergency vehicles are the only ones not subject to tickets for parking on the wrong side of the street. The only streets not included are a few narrow thoroughfares where parking is permitted only along one curb. They are cleaned during the day. The old temporary no-parking signs are used to expedite the job.

All other streets in Evanston, which were formerly cleaned during the day also, are now swept at night. The switch was made without any increase in labor costs.

Two three-man crews are employed, from about 12:30 a.m. to 8 a.m. Each crew's equipment consists of an Elgin Model 81 sweeper, a Case tractor with a two-yard Hough front-end loader, and a five cubic yard capacity International truck. The front-end loader on the tractor has an extra-wide, 72 inch bucket that makes it especially adaptable for snow-removal operations.

The sweeper pushes debris into a pile. Then, the loader transfers it to the truck. The truck driver, using a hand shovel, helps pile the debris into the scoop shovel on the front of the tractor. The two crews clean the whole city in anywhere from 10 days to two weeks, depending on weather conditions, but average about 11 complete cleanings a year compared to about 7 previously. The central business district is cleaned every night. In this area, an addi-

tional worker is employed to hand-sweep the curblines during the early evening hours.

In winter, a Barber-Greene snow-loader, aided by one of the tractors, is used to transfer snow from the streets in the business area to trucks. The street division has 17 trucks—seven GMC's, five Diamond T's, three Internationals, and two Macks,—equipped with front-end snow plows. In residential areas, these trucks, which average about three-ton capacity, pile the snow, but don't load it. They start on the side of the street where vehicles are parked, and move the snow to the opposite curbline, where it is piled on the parkway and left to melt. Then, the next night, when the cars are on the other side of the street, the plows return to remove any remaining snow.

Thanks to the fact that cars can now be ticketed, the street cleaning crews have far less to contend with. And police are able to handle the occasional violations during their regular rounds of the area being cleaned. If an illegally-parked car is discovered after 2 a.m., and there is a light in a home nearby, the officers try to locate the owner. They issue a ticket only as a last resort. The ticket requires the owner to pay a \$2 fine. Payment can be made through the mail, without the need of a court appearance.

In unusual cases, the police can have a car moved immediately. A recently-enacted ordinance provides that a vehicle parked illegally longer than six hours can be towed away to an off-street parking lot. The motorist pays \$15 for the towing job, plus storage charges. Depending on the vehicle's location, tow trucks from any one of the city's six garages are used for this work.

Actually, this emergency measure is seldom required. According to Lt. Frank M. Andrews, head of the Evanston police department's traffic division, no more than 50 motorists violate the ordinance on a typical night, and virtually all of these violations can be handled with tickets.

A major reason for the low violation rate Lt. Andrews believes, is that "the Evanston public has been well-educated in regard to the new ordinance." When the measure was adopted in October, 1952, the city conducted an intensive publicity campaign.

Small cards, entitled "Know the Law," which described the operation of the new measure, were sent out with water bills in September, 1952.

The city's two newspapers, The Evanston Review and The Evanston Daily Mail, publicized the measure before and after it became effective. One story, typical of the others, included more than six inches of copy on the front page of The Evanston Review. Besides describing the operation of the law, the article pointed to the fact that the city's 15 off-street parking lots, accommodating 627 vehicles, were available for free overnight parking. Locations of each lot were included in the story.

During the first 30 days the ordinance was in effect, tickets were not issued. Instead, yellow warning cards were placed on the windshields of illegally-parked cars. Police had anticipated issuing at least 1,000 warning cards on the first night the ordinance was in effect. But, thanks to a well-planned public relations program, only 185 violators were found. And, thanks to the 30-day "breaking-in" period, Lt. Andrews believes that Evanstonians accepted the new ordinance without complaint. This initial acceptance established a habit which is largely responsible for the low violation rate today, Lt. Andrews adds.

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San Diego County Operates 21 Refuse Disposal Sites

The Sanitation and Equipment Section of San Diego County, Calif., maintains and operates 21 public disposal sites located throughout the County. It also licenses haulers and supervises the transportation of refuse to these sites. A much larger volume of refuse, estimated at 706,952 cu. yds., was handled in 1954, but otherwise disposal site operations were continued pretty much as last year.

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Driving Hubs in Hard Pavement Surfaces

To speed up the driving of hubs in hard surface areas, a district of the Washington Department of Highways has developed a special outfit. It consists of a Binks-Quincy compressor and a Thor pavement breaker, along with a survey hub driver developed in the District Shop. A moil point is included. The outfit is portable, being mounted on a 2-wheel trailer, and can be hauled behind a light truck, car or station wagon. The moil point is used where the surface is too hard to start the hubs with the hub driver.

How to write an ARTICLE for Publication

J. L. MORRISON

Assoc. Prof., School of Journalism, University of North Carolina



WRITING, any kind of writing, goes for naught unless somebody reads it. You, Mr. Reader, are reading this copy of PUBLIC WORKS because it was written with you in mind; you must be a City or Consulting Engineer; Water, Sewer or Street Superintendent; or some other technical man or you wouldn't be getting the magazine.

Let's admit that the editor of PUBLIC WORKS has a head start on catching your interest because you're a member of his natural audience. Naturally you're interested; the public works field accounts for your livelihood.

Even so—and despite your natural interest—the editor of *Public Works* has to compete for your interest. He must outdo competing trade papers, technical manuals and all the welter of reading matter that crosses your desk each day.

How does he do it? He pushes his staff to set up attractive page layouts; he digs up charts, diagrams and photos to make news and feature items come alive; he wrestles long hours with the turgid gobble-dygook of able engineers who haven't learned to write readable copy. For what is the good to you of an article on how Middleville solved its water shortage problem unless you can be induced to read it?

The Magic Word is: Readability

Today Readability is all, having had respectability conferred on it by the panjandrums of the Associated Press. The AP had been writing gobble-dygook for years. Its teletype printers were clacking away in every American newsroom until most newspapers fed us a

An Invitation to Our Readers

We like to get articles from our readers. Here is sound advice on how to get started and the steps to follow to make article writing a painless project. Remember, the man best qualified to write an article is usually the man who has been closely connected with the work—he has all the data and background information at his fingertips.

standardized gobble-dygook, whether the paper was published in Walla Walla or Yonkers.

It took a Viennese refugee to convert the AP to Readability. Dr. Rudolph Flesch, who speaks English with a heavy accent, is the man who made Readability respectable, and those of us who love the language are in his debt.

When Dr. Flesch set about learning to read English he quickly learned to distinguish between clean writing and gobble-dygook. Of course the editors of such magazines as *Time* and *Reader's Digest* had already been writing readable English for a generation, but they had taken it for granted. It took a refugee Viennese to set down the ground rules.

And now—Mr. Reader who would like to become Mr. Writer—the biggest favor I can do for you is to urge you to beg, borrow or steal Rudolph Flesch's *The Art of Readable Writing*, published by Harper's. It's all there. I ask you to treasure Readability like a jewel; you can't even start to write an article without that basic understanding.

Remember, writing goes for naught unless somebody reads it.

Getting Started

The average man who wants to write an article finds he can't get started. The professional has no such difficulty. He knows that an article, any article, must capture the reader's interest right off, must start right off with an attention-getting device.

You must liken yourself, Mr. Writer, to the corner pitchman trying to sell the Okee-Fenokee Potato Peeler. You've got to stop those hurrying passersby readers, and tell them fast that you've got something they need. Start talking, and keep it interesting or they'll drift away.

"How many summers must a city endure water shortages before its Water Department can induce the administration to change matters?"

That's a question lead. It stimulates interest all right, and by directing it to *somebody*—instead of to anybody who might possibly be interested—you give it additional point. Begin like that, Mr. Writer, and you've gotten your article off to a flying start. Take it from there.

"Without asking anybody, he hired a rainmaker."

That's the kind of lead that never fails for the newspaper editors, the old favorite lead known as the striking statement. This amounts to something like a short quick "Believe It or Not" lead that dares the reader to put down the article. He doesn't, either, and there are dozens of readership surveys to prove it.

A descriptive lead is still one more way to get started. It's a mistake to think that descriptive leads are the private province of travel

article writers. You might write this:

"For 30 days Middleville lay parched like the desert off to the North. During that time Middlevillers were slapped with \$50 fines, then had their water turned off, every time they watered their lawns, washed their cars or tried to revive their drooping gardens and shrubbery."

Or there is the straight summary lead you find in the average news story:

"A persistent drought and an insistent Water Works Superintendent combined forces recently in Middleville to put through a bond issue in record time for a new water filtration plant."

The summary lead has the advantage of two attractions in that it (1) gives the gist of the story, and (2) carries enough interest to make the reader want to go on.

Finally, there is the narrative lead, much favored by *Time Magazine* and the slick consumer magazines whose know-how is unchallengeable. This lead always starts with an anecdote that sheds important light on the subject.

"The phone rang in the office of Alton C. Clark, Middleville's Water Works Superintendent. 'The Governor is on the line,' the operator announced with a flourish."

Planning the Article

Planning the article should come first in order. Then why do I take it up after two other topics? Simply because—for the average man sitting down to write an article—Readability is his biggest problem, and next comes Getting Started. First things first. Still, planning the article can't be shortchanged, either.

Do prepare an outline of your article, Mr. Writer. Professionals all do. If they didn't they would invariably omit some details from the considerable body of notes they painstakingly collect.

Writing down an outline—even if you think you've mastered it all in your head—helps you think through the development of your article. You will achieve unity, and proper emphasis, too. Finally, you will be able to write more spontaneously, having decided in advance how to approach each section.

I wrote down an outline for this article, and I assure you it's a snap to write.

Gathering Information

This should give you, Mr. Engineer-Writer, the least trouble. You

know your own sources better than any teacher can tell you. And much of your information is the result of personal observation anyhow.

Still, I should like to list here some of the more useful periodical guides you will find helpful in working up background information. Any large library will have the following:

Reader's Guide to Periodical Literature
International Index to Periodicals
Public Affairs Information Index
Industrial Arts Index
Agricultural Index
New York Times Index
Bibliographic Index

There is always the matter of finding illustrations for what you write. Remember, I said illustrations and not decorations.

A real illustration, whether a map, chart, graph or photo, can transform a good article into a superior one. Of course, most editors with a usable article in hand will—if they have to—settle for pictures that merely decorate the page. You always increase your chances of having your article accepted, however, whenever you accompany the manuscript with a few effective illustrations.

Style Rules

Here is another tip. Provide yourself with either *The Associated Press Style Book* or *Style Book of The New York Times*. They are obtainable at bookstores or from the organizations themselves.

Because the teletype printer is everywhere today, the AP's style is just about standard the length and breadth of the land. True, each editor of non-AP publications will insist on minor variants of AP style and it is of course politic to follow the style of the editor you're writing for.

Here are a few salient AP style rules to help you:

1. Prepare all copy with a typewriter, and double space your copy, writing on one side of the paper only.

2. Do not split a word at the end of a line, nor sentences between pages, and avoid splitting paragraphs.

3. As to numbers, spell figures

less than 10. Put in figures all numbers 10 and above. This, like so many, is a general rule and there are exceptions.

4. Use a colon to introduce a series of names or statements. Ex. Officers elected are as follows: John Smith, president . . .

5. Use a semicolon to separate elements that are themselves broken by commas. Ex. John Jones, 532 Casey St.; Joe Hays, 7 Lane St.; . . .

6. Use a dash between two figures to indicate the inclusion of all intervening figures, as May 15-18.

7. Use parentheses to insert a word within a title. Ex. *The Greensboro (N. C.) News*.

8. Quotation marks should always follow adjoining periods and commas. Ex. He wrote "Three Men on a Horse." Quotation marks don't always follow other forms of punctuation, but they always follow periods and commas. I dwell on it because it is so comforting, for a change, to come across an absolutely ironclad rule.

But there are style rules and style rules. The AP rules say that it shall be written "50 per cent" but the editor of *Public Works* insists on "50 percent."

In writing an article, then, you must—Mr. Reader—set before you the goal of *Readability First*.

Next you must have no fear of taking the plunge; adopt one of the many devices of *Getting Started* and the writing will take care of itself. Be sure to outline your article, and you need hardly be told to document it properly with background material and illustrations. Follow a few commonsense rules of English style and the job is done.

Good writing!

• • •

Two Way Radio Helps in Sewer Maintenance

To improve sewer maintenance and operation practices in San Diego County, Calif., a second mechanically-operated sewer-rod machine was put into operation in 1954. This contributed greatly in reducing the cost of cleaning operations and the number of emergency calls caused by stoppages. Improved service has resulted from the installation of two-way radios in the cars assigned to the Sanitation and Equipment Supervisor and three foremen, and has enabled savings in routing crews to troubled areas.

GETTING ADEQUATE ROADS for ALABAMA INCLUDES BRIDGE RENOVATION

A "blue print" of adequate roads does not mean 50 percent of a route completely modernized and the other 50 percent in the obsolete or obsolescent classification. I like to think of the whole State Highway System as a steadily rising stream—steadily rising toward the goal in adequacy without neglect to any part.

Our State has a large mileage of good highways and bridges that by present standards are deficient in one or more respects—with the most common one, deficient width. These highways very definitely belong to the obsolescent classification, but have too much value left in them to justify discard and replacement, even if the financial means of the Department permitted.

Complete modernization of these

W. G. PRUETT,
Alabama State Highway Engineer

obsolescent roads, even along the existing alignment would involve wider right-of-way, acquired usually by "attrition" at great effort and expense; traffic complications during construction; changes in the width and grade of the roadway and changes in roadside features and conditions of access with resulting disturbance to users of abutting property. To add to these facts, the very nature of the work involved spells high contract unit prices and expensive engineering supervision.

A moderate expenditure for correction of only the major deficiencies of selected roads and bridges in this obsolescent category has the effect

of bringing a substantial over-all mileage of the State System up to a condition of adequacy for present requirements without appreciable delay or inconvenience. Such salvaged roads and bridges supply a safety link between sections of given routes that have been recently reconstructed and fully modernized. They fit in with the new projects now and will continue to do so for ten and perhaps more years. We are just completing reconstruction of some road projects that were salvaged by widening and re-surfacing in 1938. Others in that same program are still giving satisfactory service.

An accelerated salvage program that has been in progress now for about four years has provided for widening and reconditioning over



● STEEL-TEX floor lath is used on stringers as form.



● SIDE view of finished bridge shows many details.



● BRIDGE end details; guard rail; slope paving; finish.



● COMPLETED job is inviting and provides safe driving.

200 miles of the principal routes of the State Highway System. The bridge renovating activity has been on the less important routes where numerous treated timber bridges with laminated timber floors or concrete bridges with only an 18-foot roadway width existed. Accomplishments here have been spectacular. The Bridge Betterment Program covered 9727 feet of bridges during the past year; a total of over 25,000 lin. ft., or 110 individual bridges, have been improved during this four-year period. By the end of this year every bridge on the State System which had a wooden floor will have been renovated, widened to a 22-foot or wider roadway with concrete floor slab and equipped with new steel beam handrailing.

Old concrete or composite bridges with concrete floors of 18-foot roadway have been widened by removing the concrete curbs and rails and installing steel beam handrailing on out-rigged steel posts. This procedure provides over 21 feet of roadway and, by having the railing over-

hanging, makes all of the floor available for use of traffic. Very few concrete bridges of less than 20-foot roadway now remain.

Using a crew, organized for the purpose, the cost of renovating and widening a bridge, where placing a new reinforced concrete floor slab on salvaged timber or steel stringers is included, averages about \$60.00 per lin. ft. If the substructure requires much repair, this figure could go much higher. The cost of removing existing hub guards and installing new railing is only nominal, varying between \$5.00 and \$10.00 per lineal foot of rail.

The obsolescent road salvage program includes widening the existing pavement, either by trenching or reconstructing shoulders to receive the required soil-aggregate base course; treating the widened area with bituminous applications; then paving over the entire width, usually with a bituminous plant mix material. Drainage installations are adjusted and the earthwork sections reworked within the existing right-

of-way. Widening is usually confined to the inside of curves. Adjustments to the existing grade line are held to points of critical sight distance. In a few instances climbing lanes for trucks are installed in addition.

The cost of widening averages about \$4,000 per mile. A salvaging project entirely re-paved, depending upon terrain and availability of materials, has been costing from \$7,000 to \$10,000 per mile. Except for major items such as re-paving, this is the cost of work by State Forces.

Of the total of slightly over 200 miles of such roads now completed in this program, 173 miles have been completed during the past year. A substantial mileage of such improvements is still in progress.

The pictures and data illustrating the bridge renovation program were sent to us by George W. Phillips, Chief Engineer of the Bureau of Maintenance. The work shown in the photographs was performed by maintenance forces and equipment in the Third Division.

COMPACT ACTIVATED SLUDGE PLANT DESIGNED FOR FLEXIBLE OPERATION

GUY BROWNING ARTHUR

The new sewage disposal plant recently started in Cambridge, Ohio, will be equipped for the Walker Process impingement aeration. It is designed for a flow of 8 MGD, from a present population of 17,000 and a possible 25,000 in a few years. The plant cost \$1,025,000. It was designed by Floyd G. Browne & Associates, Consulting Sanitary Engineers of Marion, Ohio, and was built by the Mosser Construction Company, of Fremont, Ohio. Charles

Armstrong was superintendent of construction. Willard W. Smith is the plant operator.

The layout includes digesters, main-aeration, pre-aeration and primary settling tanks, final tanks, the blower house and administration building, and is unusually compact and pleasing in appearance. Of course, any new plant is bright and shiny, and gives an impression of efficiency and success. In this one the businesslike arrangement and neatness are noticed especially, but attention is drawn to the flow of

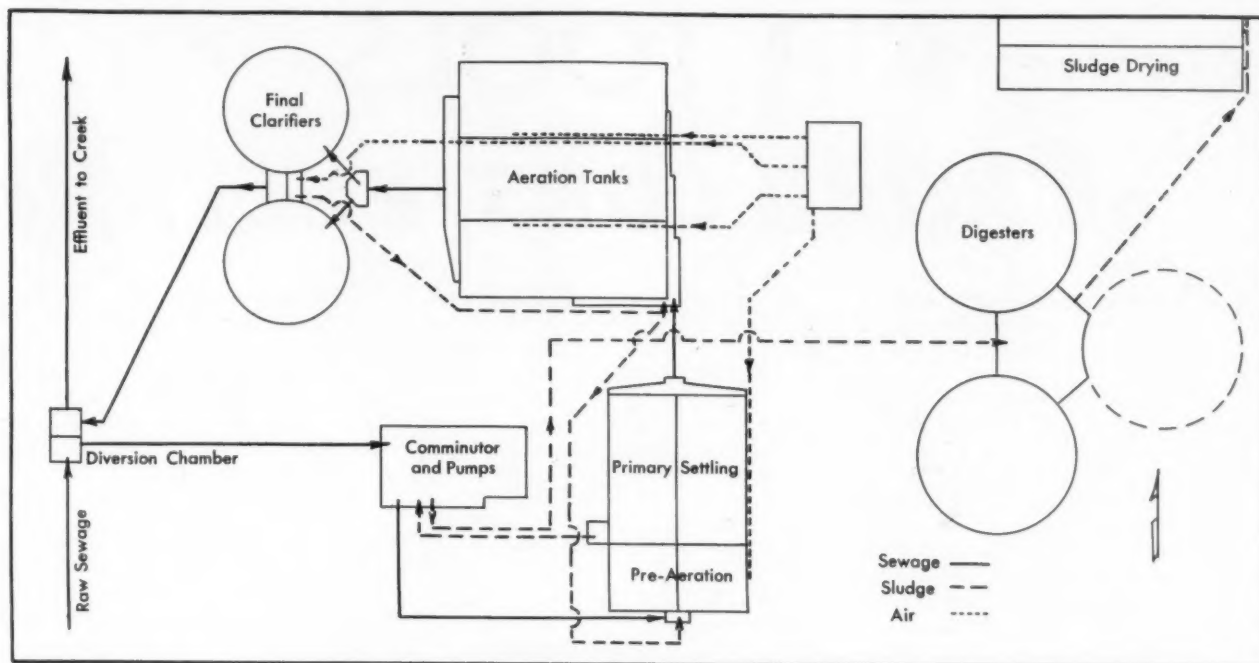
sewage through the plant. The progress of purification may be followed almost from the first step to the last. After only three weeks' operation, before the process had settled down to normal effectiveness, the effluent had no odor, and was only slightly clouded by solids in suspension. As the operation continues the effect of cumulative aeration and recirculation will be even more noticeable.

Three digesters, 50 ft. in diameter, are shown on the plans, but only two have been built. The control house is nested between the three digesters on the plan, but it is built with the "third wall" filled in. The sludge is pumped to glass covered drying beds which are 165 x 102 ft. in size. At present there is no plan for using the sludge other than to dig it out and haul it by industrial cars to a stockpile.

The main building is 42 ft. x 28 ft., one story with basement. The three main sewage pumps, 1½, 2½, and 4-mgd capacity, are installed in the basement. The two smaller ones are hooked up so as to operate singly or together, and the larger

● MAIN building under construction; digesters and blower building in rear.





● FLOW diagram and general layout of Cambridge activated sludge plant, illustrating flexibility possible in operation.

one stands alone to alternate in duty with the other two. On the grade floor are the office, laboratory, wash room, store room and stock room.

All the other units are arranged closely around the operating building, and no part of the plant is more than 200 ft. away. At one end is the integrally cast structure for pre-aeration and primary settling; to the side is the three-compartment main aeration tank; and at the end of these tanks are the two final tanks, which are 40 ft. in diameter. The digesters are at the far end of the layout, standing on the longitudinal axis of the plant. North of the digesters, just beyond the main layout, are the sludge drying beds.

Flow Plan

The streamlined flow plan illustrates how the material is pumped through the plant. Incoming sewage passes through one compartment of a diversion chamber. The effluent from the final tanks passes through the other compartment. In an emergency the raw sewage can be turned into the effluent outfall to Wills Creek, by-passing the entire plant.

A 24-in. cast iron line carries the raw sewage to the plant where it passes over screens, through the comminutor, and thence into the wet well in the main building basement to be pumped into the pre-aeration tank. It is then given primary settling, using straight-line type equipment for sludge removal. From the far end of the primary

tank the sewage goes to the main aeration tanks. Only two of the three are in use, the third being held for a standby or for increased capacity. In each of these tanks air is diffused along the bottom, along the long sides. Provision for aeration in these tanks is the same as in the pre-aeration tank, but with much greater emphasis.

By-Passes

Sewage flows from the main aeration tanks to the final tanks. Air is supplied to these tanks for a finishing treatment. Sludge is withdrawn and returned to the sludge well or to the pre-aeration tank. The effluent goes through the diversion chamber, and thence into the outfall to Wills Creek.

One of the arresting features are the provisions for operating the plant in almost any combination of units. This is done by an intricate and interesting system of by-passes.

First, the entire plant can be by-passed at the diversion chamber by simply turning the incoming sewage into the effluent outfall. That is usually provided in plants where floods or other disturbances have to be expected. The flow would then have to be chlorinated. All screening and grinding may be cut out of the line. The entire flow may be turned into the final tanks in an emergency, for aeration or any other short treatment that will be effective. Chlorination would be one element in such a treatment.

Either or both pre-aeration tanks may be by-passed. In the same way any or all of the main aeration tanks can be cut out of the line. And as a final adjustment to any difficult condition, either or both of the final tanks can be eliminated for any period. An unusual provision is for by-passing all flow exceeding 4 mgd.

Grease, removed in the pre-aeration tanks, is drawn off to the sludge well, and pumped to the digesters with raw sludge. The supernatant liquid may be returned to the pre-aeration tanks, or to the main aeration tanks, or it may be wasted at the sludge drying beds.

Equipment

The rotary skimmers, digester pumps and raw sludge pumps came from American Wells Works, in Aurora, Illinois. Builders-Providence supplied the Venturi meter—which is mounted vertically in this installation—and the air meters. Chicago Pump Company furnished the comminutor. Weinman Pump Company, Columbus, Ohio, sold the lift station pumps. Spencer Turbine Company, of Hartford, Connecticut, supplied the blowers for air diffusion. Worthington supplied the 1½, 2½, and 4-mgd sewage pumps.

Walker Process Equipment, Inc. supplied the pre-aeration, main aeration, and final equipment. Also the lifts, heat exchangers, waste gas burner, and both the floating and gas holding digester covers.

Using AIR TOOLS

on ROAD CONSTRUCTION

IMPORTANT time savings through use of air and electric Impacttools for both construction and equipment maintenance are reported by the Central Pennsylvania Quarry, Striping and Construction Co. of Hazleton, Pa. In construction of a new four-mile section of Route 126 between Crystal Springs and Breezewood, Pa., this company saved an estimated nine crew days on installation of corrugated drain pipe by using one Ingersoll-Rand air Impacttool to run more than 12,000 nuts.

This air tool was brought along to be used on 694 feet of sectional-plate drain pipe and also to facilitate field maintenance of the heavy equipment, replacing hand tools wherever possible. By using the air tool on the 78-in. to 90-in. drain pipe, a seven-man crew was able to cut nine days off the estimated hand-wrench time, a labor saving of approximately 504 man-hours on this one job alone.

Using 12,000 Bolts

Construction plans called for galvanized steel pipe to be laid across the road at three points, 324 feet of 78-in. pipe at one point; 194 feet of 84-in. pipe at another; and 176 feet of 90-in. pipe at another. Of the sectional-plate type, the pipe had to be assembled in the field, with more than 12,000 closely spaced $\frac{3}{4}$ -in. bolts.

With several men working inside the pipe and others on the outside, the holes in the overlapping sections were lined up by drifting before the bolts were inserted alternately from inside and outside. The nuts were then started by hand and tightened with the air tool. A portable air compressor supplied air for the tool, which was used with equal facility in running nuts either inside or outside the pipe.

In field maintenance, the Impacttool helped speed up operations by limiting the down-time on disabled equipment. The 10-foot steel cutting edges on the scoops had to be changed periodically, a job which entailed the removal of 38 $\frac{3}{4}$ -in. bolts. Using hand wrenches, two men normally require a minimum of three hours to get a new cutting

edge in place; with the power tool, the same job was completed in one hour, saving two valuable hours of scoop working time.

The four bolts securing each bulldozer track pad may work loose. These bolts have to be very tight to prevent damage to the pads. In all, there are 50 pads on each pair of tracks, representing a total of 200 bolts which have to be tightened, a tedious job for a man with a hand wrench. On a straight nut-running assignment like this, the Impacttool with its 1270 rotary impacts per minute works as much as ten times faster than a hand wrench, limiting

the amount of down-time for each unit to the barest minimum. As of this writing, Central Penn operates a total of 35 bull-dozer, most of which are in constant operation. Thus, just one tightening job for the full bulldozer fleet involves several thousand bolts.

Also worthy of mention is the speed at which two men using the air tool can change tires on a 22-ton Euclid dump truck. Using the tool to run 11 nuts on each dual wheel, the men in the field found that they could change two wheels in the time it formerly took them to change one with a hand wrench.



● AIR TOOLS can save money on jobs like installing this sectional-plate pipe.



Metering and Maintenance Cuts Unaccounted-For Water

IN Madison we have records, extending back to 1918 which show that the percentage of water passing through permanently set meters has increased from 57.2 percent to 90 percent and that the unaccounted-for water has decreased from 23.2 percent to 4.2 percent.

Madison has been fortunate in that water meters were installed before the turn of the century and the system has been practically fully metered during the entire period. In 1918, the water department sold 57.2 percent of its total pumpage through meters to private consumers; 11.8 percent was public consumption; 7.8 percent was consumed in operation, leaving an unaccounted-for balance of 23.2 percent. Thirty years later, 89.6 percent of the water pumped was sold through permanently set meters; the public consumption was reduced to 2.2 percent; there was consumed in operation 4 percent, and the unaccounted-for water was reduced to 4.2 percent. The important figure is the amount of water sold to private consumers through meters because some estimating is necessary on other items. The public consumption was reduced from 11.8 percent to 2.2 percent largely through the elimination of free water. In Madison all public buildings are metered, as well as all bubbling fountains; and the use of

By L. A. SMITH

Superintendent, Waterworks and
Sewerage, Madison, Wis.

water in flushing streets and sewers is all metered, as far as possible.

The reduction of water consumed in operation from 7.8 percent to 4 percent is primarily due to two factors; (1) A large amount of condensing water was necessary when the main station was steam operated. The use of a considerable portion of this water has been eliminated by the change to electric pumping. (2) The quality of water has been substantially improved. The early wells drilled in Madison produced a considerable quantity of iron. The iron-bearing formations in the upper sandstone formations

are cased off in the new wells, and all of the original wells have been abandoned. This has reduced the iron content from 2 ppm to about 0.02 ppm, materially reducing the amount of red water and decreasing the amount of flushing.

The above factors have meant that, in spite of increased costs, the output cost of water has been reduced from 6.5¢ per 100 cubic feet to 4.2¢. In accomplishing this many items had to be taken into consideration. The first and major item is—and probably always will be—the under-registration of meters. The second, and very important item is the loss of water through leakage. Other important items are the unauthorized use of water from hydrants and fire services and the careless use of water in street sprinkling, sewer flushing and construction work.

Water System Fully Metered

Before progress can be made in reducing unaccounted-for water it is not only necessary to have the system fully metered but also to have an accurate measurement of all of the water entering the distribution system. There is only one way to do this and that is to install meters at every pumping station and to test these meters periodically to insure their accuracy. Every effort

This is an abstract of a paper by Mr. Smith before the Waterworks Operators' Short Course, held last spring at Madison, Wisconsin.

must be made to measure all of the water sold. In order to do this, it is necessary not only to meter every consumer but to maintain the meters so they register accurately. In this connection, it should be noted that manufacturers of water meters have contributed tremendously to the solution of this problem in the period being discussed. A good domestic water meter will register at least 95 percent of the water passing through it at the rate of $\frac{1}{4}$ gpm and many will exceed this materially. In Madison, 85 percent of the meters are $\frac{5}{8}$ -in. and account for 50 percent of the total revenue. An additional 13 percent are meters from $\frac{3}{4}$ -in. to 2-in. inclusive which account for an additional 20 percent of the revenue, and 2 percent of the meters—larger than 2-in.—account for the balance of the remaining 30 percent of the total revenue received. Putting it another way, 98 percent of the meters register 70 percent of the water sold and the other 2 percent produce 30 percent of the revenue.

Because 85 percent of the meters are $\frac{5}{8}$ -in. a special study has been made as to the period of time which should elapse before they are tested. It is important, of course, that all stopped meters be replaced and repaired promptly, and this is done; $\frac{5}{8}$ -in. meters are brought in for testing when they have registered 100,000 cubic feet, or every eight years, whichever comes first. The same general scheme is used with reference to $\frac{3}{4}$ -in. and 1-in. meters. The larger meters, $1\frac{1}{2}$ -in. and 2-in., particularly those registering large quantities of water, are tested more often, some as often as once a year and others up to five years depending upon the consumption. All meters $\frac{5}{8}$ -in. to 2-in. inclusive are replaced and brought into the shop for repair and testing. The practice of some utilities of inserting a nipple in place of a meter, repairing the meter and resetting it in the same location, is not done in Madison for two reasons: First, it is necessary to estimate the water used when the meter is not in service and, second, two trips are necessary for every meter repaired. In Madison repaired and tested meters are used to replace meters that are brought into the shop for testing. The meter registers are set back to zero, which simplifies the billing procedure.

All meters 3-in. and larger are compound meters and are tested in place. Meters of this size are tested at least after every two years and a considerable number of those

serving large consumers are tested twice a year. The city of Madison furnishes water to three villages and three sanitary districts on a wholesale basis, as well as to several large industrial users. All of these meters are tested twice each year.

Continuity of service is important. In the villages and sanitary districts this is assured by having two connections to the distribution system, with a meter on each one so that in case it is necessary to repair or test one of the meters continuous service can be given through the other connection. In hotels, hospitals, large business buildings and apartment houses two or more meters are placed in parallel to avoid discontinuing service when repair or replacement is necessary.

Meter Maintenance

When meters $\frac{5}{8}$ -in. to 2-in. are brought into the shop they are taken apart, cleaned and the necessary repair parts installed, after which they are tested. If the cost of repairing a meter exceeds 50 percent of the cost of a new meter it is junked. If a repaired $\frac{5}{8}$ -in. meter does not register at least 90 percent at $\frac{1}{4}$ gpm, this meter is also junked. Testing at this rate is desirable because large quantities of water are used by consumers at comparatively low rates of flow. It is important that meters of the proper size be used. A meter that is too large not only has a higher demand charge but also does not register as accurately as a small meter on fine flows. On the other hand, a meter that is too small runs too fast, with the result that it wears out more quickly.

At the end of 1953 there were 21,788 meters in service in Madison, 3,061 meters were removed and replaced at an average cost of \$1.75 per meter; 2,765 meters were repaired and tested, the labor cost being \$2.92 per meter and the cost of materials being \$3.16 per meter. The total cost of removing, replacing and repairing meters in 1953 was \$21,700, the unit cost being \$7.84 per meter actually serviced. This is approximately \$1.70 per meter in service per year. In Madison the cost of sewage disposal and the operation of the sewer system is on the utility basis, the sewer bills being 90 percent of the water bills. The water and sewer utilities share the cost of meter maintenance, so that the cost of maintaining the meters chargeable to the water utility is approximately 85¢ per meter in service per year.

In addition to the under-registration of meters, there is a consider-

able loss of water through leakage, unauthorized use and careless use. The reduction of water lost through leakage involves finding and repairing leaks promptly. In a substantial majority of leaks in Madison the water comes up to the surface of the ground. However, in some cases, it seeps away in sandy soils or gets into sanitary or storm sewers, with no evidence on the surface of the ground. Meter inspectors listen on the meters when reading and if there is a hum when the meter is not running it indicates a service leak. The hydrant inspectors and repair crews carry aquaphones and listen on hydrants. Whenever the characteristic noise of a leak is found the distribution system in that locality is checked at once to determine the location of the leak. This is done by the use of aquaphones, stethoscopes and leak locators. As soon as the leak is found it is repaired promptly. When there is a light fall of snow, melted spots on the pavement are checked carefully as these quite often indicate underground leaks. Inspection of sewer flows between 2 and 5 in the morning also result in finding leaks. If a large flow of clear water is running in a sewer at that time of day it is caused by either air conditioning equipment or leakage.

The unauthorized use of water from hydrants is always a problem in every community. The ordinances of the city of Madison provide penalties for such unauthorized use. Contractors, tree sprayers and others who need water from hydrants are required to make an application at the office, after which a sprinkling valve is set on the hydrant for this use. The minimum charge for the use of water from a hydrant is \$10, which takes care of the ordinary small use. On street construction a meter is set, or the water is charged on a liberal flat rate basis which is ample to cover this item. In the construction of large buildings, meters are set to meter the water during the construction period. In the ordinary home construction flat rates are applied, which are entirely adequate. The careless use of water in street sprinkling and sewer flushing has been largely eliminated by metering.

Meter inspectors check fire services to prevent the unauthorized use of water from these services. In general, fire services are unmetered, but in a few special cases $\frac{5}{8}$ -in. telltale meters are installed in the fire lines to assure that no unauthorized water is being used.

APWA News

AMERICAN PUBLIC WORKS ASSOCIATION
1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

APWA Research Foundation Organized

The Board of Directors of the Association held their mid-winter meeting in Milwaukee, Wisconsin, January 28, 1955. Highlighting the actions taken by the Board was the approval of the Articles of Organization of the APWA Research Foundation. The purpose of the Foundation is to "... provide or assist in providing the means and machinery by which funds can be collected and disbursed to finance or assist in financing research and scientific investigation in the broad field of public works engineering and administration ...".

The management and control of the foundation is placed in the hands of a Board of Trustees consisting of the following members who were appointed by the President and approved by the Association's Board of Directors. William A. Bowes, Commissioner of Public Works, Portland, Oregon; W. A. Hardenbergh, President and Editor, PUBLIC WORKS MAGAZINE, New York, N. Y.; and Glenn Richards,

Commissioner of Public Works, Detroit, Michigan, for one-year terms; Robert Sawyer, Managing Director, Philadelphia, Pennsylvania; Ben West, Mayor, Nashville, Tennessee; and Earnest Boyce, Professor of Civil Engineering, University of Michigan, Ann Arbor, Michigan, for two-year terms; and Frederick H. Zurmuhlen, Commissioner of Public Works, New York, N. Y.; Edward Cleary, Executive Director, Ohio River Valley Water Sanitation Commission, Cincinnati, Ohio; and Harmer Davis, Director, Institute of Transportation and Traffic Engineering, University of California, Berkeley California, for three years.

This Board of Trustees will elect its officers and formulate plans for collecting funds and approving research projects within the next few months. Several projects have already been proposed. Others may be submitted to the Executive Director of the Association for transmittal to the Board of Trustees of this new Foundation.

Special Report on Industrial Waste Disposal Charges

A new publication has just been issued by the Association which will be of considerable value to public works officials throughout the entire country. Its title is Special Report No. 18-S—"Industrial Waste Disposal Charges In Cities Over 5,000 Population."

This 81-page report was prepared by the APWA Committee on Sewerage and Sewage Disposal, which is headed by John Baffa, Consulting Engineer of New York City. The rate schedules of 161 cities are included in this report, as well as, a summary of the industrial waste disposal regulations in effect in many cities, and other related data.

The report points out that four principal methods are used to determine industrial waste disposal charges. The charge may be based upon (1) a percentage of the water bill; (2) a separate schedule of

water use; (3) flat rates; or (4) upon the quantity of water used and the quality of the wastes that are discharged into the sewerage system. Detailed rate schedules of twenty-three cities that consider the quality of the wastes discharged in fixing their charges are among those included in this report.

This new publication lists a total of 49 cities whose industrial waste volume constitutes over 25 percent of their sewage treatment load. Fifteen of these indicated that such wastes constitute over 50 percent of their total load. Other interesting information is also contained in this special report which is priced at \$3.00 per copy to non-members of the APWA.

Other members of the Committee which prepared this report are: J. F. Laboon, Chairman, Pittsburgh Sanitary Authority; Edward J.

President	
Warren A. Coolidge	
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CHAPTER ACTIVITIES

Samuel S. Baxter, 1947 President of the APWA, and present Commissioner of Water for the City of Philadelphia, discussed the history and development of their sewage disposal program at a meeting of the **Philadelphia Metropolitan Chapter**, January 27. A total of fifty members and guests were in attendance at the meeting which was held in the Gold Room of the Engineers Club of Philadelphia.

The Sixth Annual Iowa Public Works Conference was held in Ames, February 10 and 11. The Conference was sponsored by the Engineering Extension Service of Iowa State College and was presented by the Civil Engineering De-



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partment of Iowa State College and the Iowa Chapter of the APWA. Among the topics discussed at the Conference were: "Utility Problems in Subdivisions and Annexations" by Donald A. Anderson, Planning Director of Des Moines; "How To Sell Your Program" by LaVerne Schiltz, City Manager of Dubuque; and "Openings In Streets For Utility Services" by Carl Fagerlind, Street Commissioner of Waterloo. Other interesting papers were also presented at this Conference which was conducted under the direction of Lowell O. Stewart, Professor and Head of Civil Engineering of Iowa State College.

Harold T. Porter, Business Manager of the Orleans Parish Schools was the guest speaker at the February Meeting of the New Orleans Chapter of the APWA.

The Tennessee Chapter held a joint meeting with the Tennessee Building Officials Association, February 2-3, at Jackson. Sterling Roberts, State Director of the Federal Housing Administration of Memphis spoke on the subject of "Urban Renewal In Tennessee" at the opening session. Lorin B. Allen, of the Consulting Engineering firm of Allen & Hoshall of Memphis, gave an informative talk on "Storm Sewers and Inlet Design"; films on asphalt and soil cement streets were presented, as well as, a talk on "Non-Slippery Asphalt Pavements" by William A. Goodwin, Consulting Engineer of Louisville, Kentucky.

"Warren A. Coolidge, Director of Public Works of Nashville and President of the APWA, discussed "The Role of the Engineer in Public Works" at the dinner meeting while David Burkhalter, City Manager of Elizabethton spoke on the subject of "Coordinating Public Works Activities". The meeting ended with an interesting talk on "Programming Public Works" by Guy J. Kelnhofer, Jr. of the Tennessee State Planning Commission. Credit for arranging the excellent program goes to D. V. Allen, City Engineer of Jackson and Murphy U. Snoderly, Public Works Consultant of the Municipal Technical Advisory Service of Knoxville, who are President and Secretary-Treasurer, respectively, of the Tennessee Chapter of the APWA.

A total of sixty members and guests attended the January meeting of the Northern California Chapter which was held in Oakland. H. A. Knudsen, Manager of the Sewage Disposal Division of the East Bay Municipal Utilities District presented a brief report of

the Chapter Committee on "Infiltration of Water into Sanitary Sewers". Chester G. Smith, Chief Deputy of the Contra Costa County Surveyor's Office also presented a progress report of the Chapter Committee which is studying the "California Subdivision Map Act". Mortimer Smith, President of the Oakland Title Insurance Company was the guest speaker at the meeting. His talk—"Public Relations—Practice Makes Perfect" was very informative and proved to be of considerable interest since the public works official is generally in the front lines, so to speak, where barrage of public opinion is the heaviest.

Members of the Northern California Chapters also met in Berkeley, February 3, at a dinner meeting which it sponsored as part of the seventh annual California Street and Highway Conference. E. V. Laitone, Professor of Mechanical Engineering at the University of California was guest speaker at this meeting.

PERSONALS

Francis S. Friel, President of Albright & Friel, consulting engineers of Philadelphia, has been elected President of the American Institute of Consulting Engineers, an organization comprising outstanding consulting engineers in all fields of engineering.

James D. Caldwell, who has been with the Institute of Inter-American Affairs in the Dominican Republic, Venezuela and Haiti during the past eight years, has been transferred to Ecuador.

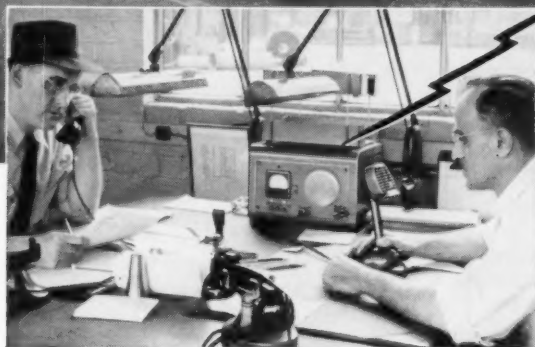
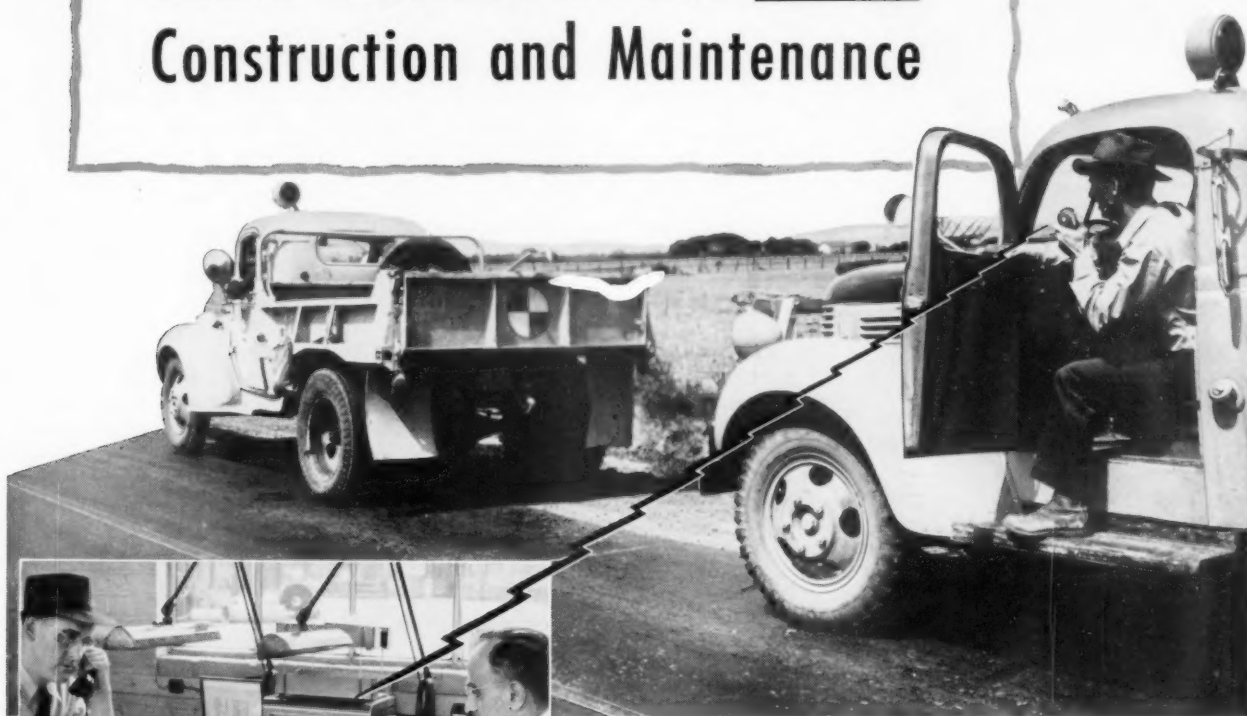
Manhattan College Conference on Waste Treatment

A Conference on Biological Waste Treatment will be held at Manhattan College April 13-15. Speakers will present 34 technical papers on the various phases of this problem. Full information from W. W. Eckenfelder, Ass't. Prof., Civil Engineering Department, Manhattan College, New York 71, N. Y.

Sanitary Engineer Available

A sanitary and public health engineer with wide experience in promotion of sizable water, sewerage and other sanitation projects is available. His experience includes work with state sanitary engineering divisions, in the Army during World War II and overseas with UNRRA and IIAA, plus three years of college teaching. Address box 3A, Public Works, 310 East 45th St., New York 17, N. Y.

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Washington



news

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Public Works Coordinator Is Recommended

THE greatest boost to public works coordination and planning in the generation since the National Resources Planning Board was established, was found in President Eisenhower's "state-of-the-union" message to the Congress on January 7th. Specifically, the President suggested the creation of a new office, within his own White House staff, of public works coordinator. Here are the President's words:

"The Nation's public works activities are tremendous in scope. It is expected that more than \$12 billions will be expended in 1955 for the development of land, water and other resources; control of floods and navigation and harbor improvements; construction of roads, schools, and municipal water supplies, and disposal of domestic and industrial wastes. Many of the Federal, State and local agencies responsible for this work are, in their separate capacities, highly efficient. But public works activities are closely inter-related and have a substantial influence on the growth of the country. Moreover, in times of threatening economic contraction, they may become a valuable sustaining force. To these ends, efficient planning and execution of the Nation's public works require both the co-ordination of Federal activities and effective co-operation with State and local governments.

"The Council of Economic Advisers, through its public works planning section, has made important advances during the past year in effecting this co-ordination and co-operation. In view of the success of these initial efforts, and to give more emphasis and continuity to this essential co-ordination, I shall request the Congress to appropriate funds for the support of an Office of Co-ordinator of Public Works in the Executive Office of the President."

Public Works Highlights

The President sent his budget message to the Congress January 17th. It is estimated that federally-collected, locally shared revenues will comprise about 8 percent of the budgets of local government. Here are the highlights in the President's request for funds for activities of special interest to public works officials:

Federal Aid to Airports: Appropriated 1955—\$22 million; requested 1956—\$11 million.

Federal Aid to Highways: Appropriated 1955—\$680 million, including \$175 million for urban roads; requested 1956—\$680 million, including \$175 million for urban roads.

Interest-Free Loans for Advance Planning of Public Works: Appropriated 1955 — \$1.5 million; requested 1956—\$8.5 million.

Public Facility Loans (for municipalities under 25,000 unable to secure private financing for public works, at 4.25% interest): Appropriated 1955—\$2 million; none requested for 1956.

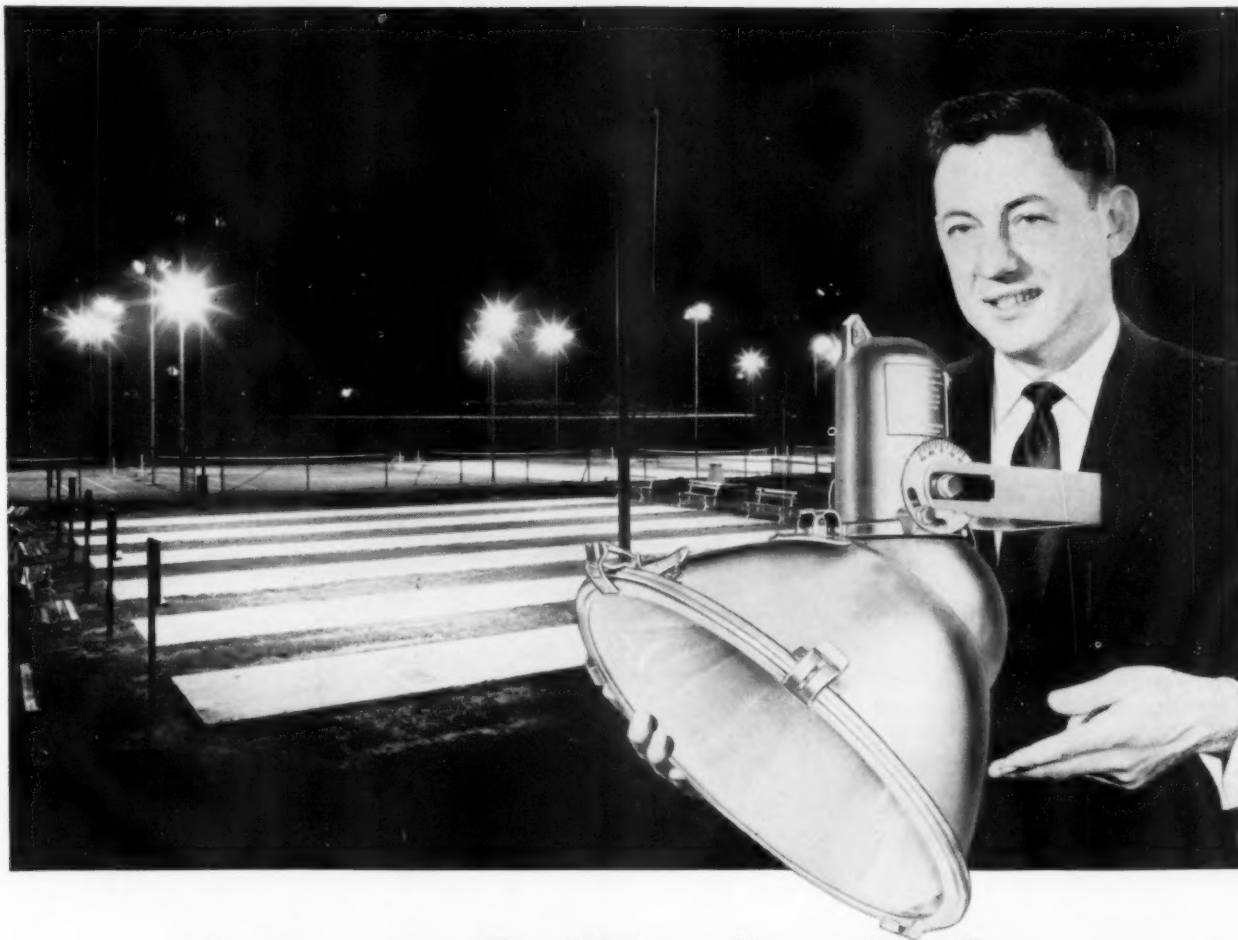
Urban Planning Grants (to assist states to aid metropolitan, regional and small city planning): Appropriated 1955—\$1 million; requested 1956—\$4 million.

Slum Clearance: Capital grants appropriated 1955—\$39 million; capital grants requested 1956—\$60 million.

Disaster Relief Loans (to repair disaster destroyed or damaged public facilities): Appropriated 1955—\$10 million; requested 1956—\$10 million (revolving fund).

Public Housing: Appropriated 1955—funds for 35,000 units; requested 1956—funds for 35,000 units for fiscal year '56 and '57.

Federal Aid for Hospital Construction (hospitals, rehabilitation centers, diagnostic and treatment centers, nursing homes, public health centers, related health facilities): Appropriated 1955—\$96 million; requested 1956—\$125 million.



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Civil Defense Loans (aid in financing projects for CD purposes upon certification by FCD Administrator): Revolving fund—\$250 million; commitments 1955 (all hospitals) 9 @ \$2,154,830; commitments expected 1956—\$2.8 million.

Federal Aid for Water Pollution Control: Appropriated 1955—\$903,000; requested 1956—(A) operating expenses—\$1,428,500; (B) program grants to states in support of control agencies—\$1 million; (C) research at the National Institutes of Health—\$1 million.

Federal Aid for Air Pollution Control: Appropriated 1955—\$500,000 (research); requested 1956—\$594,000.

• • • Pipe Line Patrol with 2-Way Radios

Following a break in a 30-inch main which caused considerable property damage and successful suits against the city, the Long Beach, (Calif.) Water Department now maintains a periodic patrol over all mains 20-inch and larger in size. This patrol is maintained by using emergency service vehicles equipped with 2-way radios, and is incidental to other regular duties.

Next Best to a Sky-Hook

WITH the combination of the new International truck and the hydraulically operated, two-man boom it mounts, St. Louis' Union Electric Company boasts a trouble-shooting vehicle of rare flexibility



and versatility. Function of the truck is that of transportation and working base for servicing overhead power lines, transformers, and poles. Apparatus is a combination workshop and tool shed on

wheels, equipped with retractable power-operated boom, two-man crow's nest, and electrically operated steady-legs that insure lateral stability when the boom is elevated. The extension, powered by an engine mounted on the rear of the truck, permits lateral flexibility and provides minimum vertical range to permit operations above a 35-foot line. In typical operation, workers climb into double buckets at end of boom, are raised to the job, and begin work. To assure workers' safety, fiberglass buckets are insulated from metal of boom by special molding. In addition, upper boom is insulated against accidental wire contacts. Steel mesh "headache rack" protects the truck cab from falling objects.

• • • Many More Toll Roads Being Considered

Study and planning for more than 5,000 miles of toll roads are under way in some 24 states. The estimated cost of these roads is about \$5.6 billion. Already 1350 miles of toll roads are reported in operation, with another 1400 miles under construction or authorized.

TO PLAN A MODERN INCINERATOR Every Municipal and Design Engineer needs this information

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Do you allow extra headroom over hoppers for the refuse that hangs below the bottom of the bucket?

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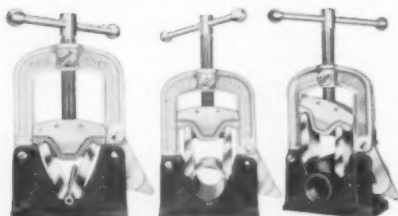
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World's Finest
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BOOKS IN BRIEF

REPORT OF BUREAU OF PUBLIC ROADS

The 1954 Annual Report discusses all phases of the Federal-aid construction program, which reached new high levels in 1954, including improvements on the National System of Interstate Highways, on primary and urban highways and on farm-to-market roads. The report contains 73 pages and the cost is 30¢. Copies from the Supt. of Documents, U. S. Government Printing Office, Washington 25, D. C.

LUBRICATING OILS FOR INDUSTRIAL ENGINES

This is the title of a 47-page booklet published by the Internal Combustion Engine Institute, Chicago 6, Ill. The names of the oil suppliers are listed alphabetically, and the types are described in three columns headed, "Type A," "Type B," and "Type C." Copies from the Institute. The price is 20¢.

WATER SERVICE

The Missouri Water and Sewerage Conference has prepared a Manual on "Water Service Rules and Regulations." Copies from Warren A. Kramer, Secretary - Treasurer, MWSC, State Office Bldg., Jefferson City, Mo. The price is \$2.00 per copy.

HIGHWAY-USER TAXATION

Bulletin 92 contains three papers presented at the 1954 Meeting of the Highway Research Board, under the auspices of the Committee on Highway Taxation and Finance of the Department of Economics, Finance and Administration: "Objectives and Concepts of Highway User Taxation," by Richard M. Zetzel; "Estimate of User Taxes Paid by Vehicles in Different Type and Weight Groups," by Edwin M. Cope, John T. Lynch, and Clarence A. Steele; and "Gasoline Consumption, Weight, and Mileage of Commercial Vehicles," by Robley Winfrey. 48 pages. Price 75¢. Request publication 340. Copies from Highway Research Board, 2101 Constitution Ave., Washington, D. C.

FLUORIDATION OF WATER

"Fluoridation as a Public Health Measure" is a monograph of the American Association for the Advancement of Science. It is a "reasonably complete evaluation of the present knowledge of the relation of fluoride ingestion to human health." James Shaw edited the text. 225 pages; \$4.50; from the Association, 1515 Massachusetts Ave., N.W., Washington 5, D. C.

SCIENTIFIC BASIS OF ROAD DESIGN

This is an excellent book, by an English engineer, which is designed to give the basic information on which design of roads should be founded, suggest information for an understanding of the empirical formulas often used in road design and



● RUBBER pavement being laid in Washington, D. C. Additive is a synthetic rubber latex developed by Firestone. These test sections will be checked to determine serviceability. A Barber-Greene paver and Buffalo Springfield roller are shown.

enable the engineer to interpret and apply his results with intelligence. 334 pages. By F. L. D. Woollorton. St. Martin's Press, Inc., 103 Park Ave., New York 17, N. Y. \$12.

FIFTY YEARS ON TRACKS

This book was published to commemorate the fiftieth anniversary of Caterpillar Tractor Co. Beautifully illustrated, it tells the story of Caterpillar—and its important predecessors—from the beginning back in the nineteenth century. It also presents a cross-section view of the company today in regard to its employees, plants, business friends, products and markets. It contains 103 pages. Caterpillar Tractor Co., Peoria, Ill.

CLEAN WATER

"Clean Water and How to Get It" is the title of a Manual that has been prepared by the General Electric Co. It covers pollution, the steps to be taken to prevent it, the results achieved, etc.; 32 pages. Copies free from General Electric Co., Schenectady, N. Y.

CIVIL ENGINEERING EXAMINATIONS

A new enlarged and revised book is now available covering examinations given by the State of California for the registration of Civil Engineers and Engineers in training. It contains the examinations given between 1940 and 1949, including the unofficial solutions of the problems by the author; also the examinations from 1949 to Dec., 1953, incl. 287 pages. Price \$7.00, plus tax. Copies from August E. Waegemann, 2833 Webster St., San Francisco 23, Calif.

EVANSTON CIVIL DEFENSE

This booklet, covering civil defense activities in Evanston, Ill., contains 15 pages, with illustrations. Copies are 15¢ each and can be obtained from the Evanston Civil Defense Corps, Municipal Bldg, Evanston, Ill.

HOUSE & STREET NUMBERING & STREET NAMES & SIGNS

This is a complete bibliography of all the material that could be found on the subject of house numbering, street names, street signing and related data. It is divided into three sections: (1) Complete works, including books; (2) articles or sections in books; and (3) articles in periodicals. 16 pages, single-spaced,

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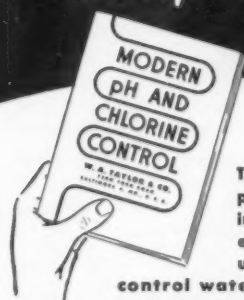
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vice and tool-heating compartment... all in one unit. Patchmobile PM-215 is equipped with kerosene burners, power fuel pump, or optional propane heating. Also available with skid mounting for stationary operations.

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mimeographed. This was prepared by Solomon Goodman, 31-31 29th St., Long Island City 6, New York. To cover the cost of mimeographing, the charge is \$1.25 per copy.

• • •

Effect Of Highway Design On Accidents

A unique opportunity to study the effect of highway design on accidents arose in 1947 with the completion of a new road, on new location, replacing the old U. S. 40 between Frederick and Hagerstown, Md. The old road continues in use. Both are two-lane roads, cross the same two mountain ridges, and have about the same total rise and fall, but some of their design characteristics are very different.

The old road is typical of our older mountain highways, with steep grades, sharp curves, narrow shoulders, and generally poor sight distance; 45 percent of its length is marked for no passing.

The new road has excellent sight distance (only 12 percent marked for no passing), no curves sharper than 4 degrees, many long straight sections, and wide paved shoulders. The grades are long, steep, and usually on straightaways, but in most respects it is a typical modern highway.

Analysis has been completed of the 554 accidents investigated by the State Police on rural portions of the two roads in the 6 years 1948-53. Results of the study appear in the FY 1954 report of the Bureau of Public Roads. The accident rates for the two roads were practically identical, 1.8 per million vehicle-miles of travel on the old road and 1.9 on the new. Both were slightly below the statewide rate of 2.0 for rural highways in the same period.

There were important differences in the kinds of accidents which predominated on the two roads and in the places where they occurred. The curves on the old road were dangerous, with a rate of 3.5 accidents per million vehicle-miles as compared with 1.5 on the straightaways. On the new road the curves were notably safe, with only 0.9 of an accident per million vehicle-miles, while the straightaways had a rate of 2.0. Rear-end collisions were much more common on the new road than on the old, happening principally on steep upgrades where fast-moving passenger cars suddenly came upon the slower commercial vehicles. These findings provide a better understanding of the importance of sight distance, curvature, and gradient in the frequency of accidents.

Switch

TO DUAL FUEL DIESEL BRINGS MORE REVENUE TO CITY

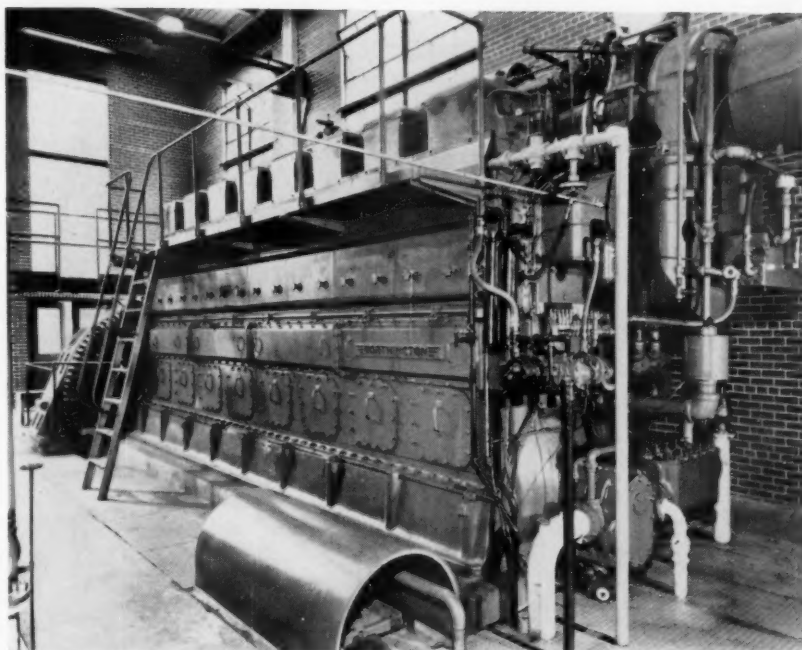
HARRY A. EINHART,

Manager of Utilities Clyde, Ohio

THE RATE of population growth of Clyde, O., in the last ten years has been so rapid that the municipal utilities were unable to keep up with the resulting demand. Therefore, in 1952, Clyde's voters approved a \$595,000 bond issue for two 2010 horsepower dual fuel Diesel engines and a new power plant building addition. Last fall a new elementary grade school was completed costing the citizens \$608,751. Under construction now, at an estimated cost of \$425,000, is a trickling filter separate sludge digestion sewage plant.

Starting in 1893 with two 150-kw steam engines, the power plant was enlarged; by 1940, the steam engines were discarded and two Elliott steam turbines, one rated at 750-kw and the other at 1250-kw, had been installed and these carried the load until 1953, coal continuing to be the raw material depended upon to generate the steam required in the turbines. During the period 1944 through 1954, coal delivered to the storage pile gradually increased from \$4.50 to \$9.30 per ton; plant labor costs also doubled during this period. And there developed a serious power shortage problem. Power generation climbed steadily from 3,400,000 kw during the years 1945 and 1946 to 6,000,000 kwh in 1953.

Several years ago, Clyde started an incentive system to make operating personnel more versatile in their duties. The men are trained to do limited maintenance on the equipment, and to make complete analyses and titration tests on the water at the filtration plant. All expenses are paid by the City for those who want to attend specialized classes at the University in Columbus, Ohio. After these men have passed the course and obtain a license, they are given additional



● ONE OF the two Worthington 2010-horsepower diesel engines which replace steam equipment for regular service. Later these engines will operate on natural gas.

remuneration. No new operators were hired when the change was made from steam to Diesel generation. Key men who had obtained Diesel engine schooling were sent to the factory where the engines were built for further instruction in Diesel maintenance and operation.

While the number of electric customers and the annual revenue from the sale of current increased yearly, the profits steadily decreased due, primarily, to the rising cost of coal and labor. There was no assurance that the price of coal would decrease and it became a problem of economics. More power was needed. Should the city continue with steam and purchase a new high pressure boiler and turbine, or revert to some other means of generating power?

Under the able leadership of Clyde's Board of Trustees of Public Affairs and Consulting Engineer, Wilson W. Kohli of Tiffin, Ohio,

it was decided that the answer to the economic power problems was dual-fuel Diesel engines. In April, 1952, competitive bids were received by the Board of Public Affairs and the Council. It was decided to purchase two Worthington 2010-horsepower supercharged dual-fuel Diesel engines. They were to carry the plant base load and the steam equipment would remain as standby.

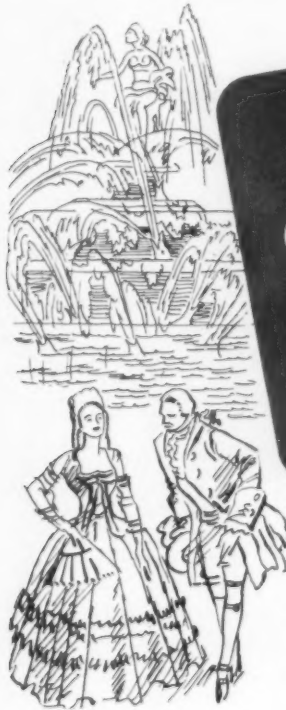
Natural gas is not yet available to Clyde, so the engines are running on straight Diesel fuel. Although the Diesel engines have been operating only a short time, they have demonstrated their ability to generate power at a considerable saving over steam. At the end of 1952, fuel costs averaged 11.3 mills per net kwh when the entire load was carried by the steam equipment. By the end of 1953, fuel costs dropped to 7.88 mills per net kwh as the Diesels began to take over the load. Fuel costs at the beginning of 1954 re-

verted to what they were ten years before.

Permission to use natural gas is expected by 1955. At a rate of 65 cents per thousand cubic feet for natural gas and pilot oil at 9.59 cents per gallon, a further saving in fuel costs will be realized. Fuel costs of 6.4 mills per kw are expected with gas and pilot oil operation. This will be equal to steam generation costs of fifteen years ago. For the past five years, the average amount of coal used per kilowatt generated in the steam plant has been 2.49 pounds. The diesel plant,

since it started operation, has averaged 12.77 kwh per gallon of fuel oil with a running load factor of approximately 60 percent.

A direct comparison between steam and Diesel engine operating performance is possible for the first eight months of 1953 for steam generation and the first nine months for Diesel generation in 1954. The average monthly fuel bill for the 1953 period for the steam equipment was \$6,664.25 as compared to \$4,273.33 for the Diesels in the 1954 period; or 1.129 cents per kw for the turbines and 0.788 cent for the Diesels.



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The accessory equipment in the steam plant consumed almost three times more power than the Diesel plant, and at their generating rates, cost the Village a monthly average of \$1,107.36 as compared to \$271.55 for the Diesel engines. Water pumped for cooling purposes during steam operation was almost five times that used for the Diesels. Gallons per kw generated monthly averaged 2.85 against .645 for the Diesel operation.

A better example of comparison between Clyde's steam operation and Diesel plant operation is shown for the months of March, 1953, and April, 1954, where the total kw generated were the same. The steam unit fuel cost for March, 1953, amounted to \$6,244; and for April, 1954, \$4,608 was spent for Diesel oil. Had 1,000 Btu per cubic foot natural gas at a cost of 65¢ per 1,000 cubic feet been available, the fuel cost would have been \$3,757. The steam plant auxiliary equipment consumed 91,540 kw, and 1,668,000 gallons of water were used for cooling, while the Diesels used 36,100 kw and 308,000 gallons of water.

Plant operation and design contribute greatly to Clyde's outstanding operating economy. All station auxiliary equipment is easily accessible for repair and maintenance. The engine gaugeboard is located between the two engines, easily visible to operating personnel. Station piping is painted with different colors, designating air, water, lubricating oil, gas, and fuel oil. Jacket water is conditioned by the chromatic process and circulated continuously through both engines. Either engine is then available for immediate loading without the normal pre-warm-up period. Jacket water is also used for plant heating during the cold season.

The load is divided between the two Diesel engines to equalize wear on rotating parts. A periodic system of engine logging at half-hour intervals is strictly adhered to.

Clyde's engines are designed to produce maximum power output at high ambient air temperatures. Dual-fuel engines perform better with saturated air than they do with dry air. Saturated air lowers the initial temperature of the charge in the cylinder and, therefore, the end compression temperature. The molecular structure of gas tends to break down under high pressure and temperature into knock-producing compounds. Detonation is prevented by lowering compression temperatures which suppress these knock-producing compounds. Satu-

rated air obtains additional cooling by virtue of vaporization.

Installed on the power plant roof are two Marley #203 Aquatowers used for precooling the intake air. It is possible totally to saturate this intake air and thereby reduce the ambient air temperature down to almost wet bulb temperatures. Circulating water is pumped to the pre-cooler distribution trough, where it trickles downward through a series of baffles in the intake air stream to the basin to be recirculated. Make-up water is maintained by a float valve in the pre-cooler basin. Fresh intake air passes through oil bath filters before entering the pre-cooler. However, during periods of straight oil operation, the pre-cooler is not used, as humidified air is not beneficial for Diesel operation.

Last year Clyde had a net revenue of \$305,895 from its electric power and water plants. This was, in part, accomplished by employing the use of a more efficient means of producing power.

More water was available for revenue, and more power was available to the consumer. With the expectation of gas in the near future, dual fuel operation can be expected to result in further savings.

Course on Ecology of Fresh Waters

Summer sessions of the University of Pittsburgh will include a course, from June 13 through July 1, on the ecology of fresh waters in relation to human use. This will be of interest to sanitary engineers, chemists and biologists. More data from Prof. M. A. Shapiro, Graduate School of Public Health, University of Pittsburgh, Pittsburgh 13, Pa.

Control of Air Pollution in Los Angeles County

Los Angeles Co. has recommended the appointment of a 21-member air pollution control commission in connection with an air pollution control study. There will be a full-time coordinator. The inspection division will be expanded from 39 inspectors to 120 in order to provide stricter enforcement of air pollution laws and ordinances. A major research program into the cause of smog has been recommended by the League of California Cities. If the problem cannot be solved by the regional authorities, it is recommended that the state public health department take on the work.

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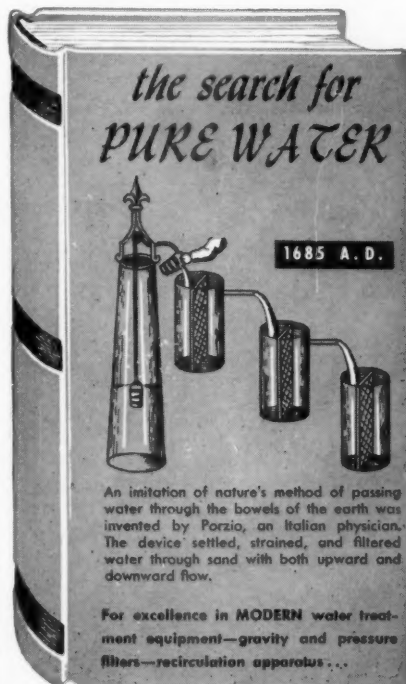
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Highway Sufficiency Ratings

In order to provide a sound and logical basis for the selection of a highway construction program, a method of rating highways has been developed and is being used by some 22 States and the Bureau of Public Roads at the present time.

Such a rating is called a "sufficiency rating" and attempts to answer the question: How sufficient or adequate is each section of highway when compared to a highway properly constructed?

The theory of sufficiency ratings is extremely simple. A completely adequate section of highway rates 100. Par values are assigned to each highway element, width, for example; and sections which do not rate 100 are marked down accordingly. The end product is a rating for each highway section showing its adequacy in relation to all other sections as well as to the perfect score of 100.

The basic engineering yardstick

used to measure or evaluate the adequacy of a highway is a set of highway standards developed by the American Association of State Highway Officials. For the purposes of measurement, the elements of which the modern highway is composed are divided into three major categories: structural condition, safety, and service.

Structural condition is concerned with the structural design of the highway and indicates its ability to support the present loads. It is assigned a par value of 50. This is further sub-divided into foundation, 31 points; drainage, 7 points; and surface, 12 points.

Safety is given a par value of 25 points and is divided into roadbed width, 7 points; surface width, 6 points; stopping sight distance, 8 points; and consistency of alignment and grade, 4 points.

Service is rated on how well the highway serves the motorist, and is given a par value of 25 points. The main sub-divisions are operating speed or alignment, 11 points; passing sight distance, 6 points; and ease of travel, (surface width and ridability) 8 points.

In rating each section, consideration is also given to weak bridges, floods, slides and accidents. After each section of highway is rated, it is adjusted for the traffic volume to give a lower rating to heavily travelled highways and a higher rating to lower volume highways.

Vermont is one of the States that has adopted this rating and sufficiency ratings are now available for the entire state highway system. At the present time, 539 miles of Vermont have a rating less than 60. The figure of 60 has been tentatively selected as the point between reasonably serviceable and not reasonably serviceable. These are the highways which need rebuilding. In selecting each year's highway program, highway sections in the low rating groups are given priority. State highway connections within cities and villages in Vermont have not been rated as yet, but the State Highway Board plans to establish sufficiency ratings on this highway group as soon as possible. These data are from the Board's annual report.

• • •

Tree Maintenance

In 1954, the 3 tree crews in San Diego Co., Calif., trimmed 7,554 trees, repaired 32, and removed 620 that were dead, diseased, or in the path of planned public improvements.



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Effects of Fluorides in Water Supplies

ON the basis of present knowledge about the prevention of tooth decay, one proposal appears to have a tangible potentiality for appreciably reducing the amount of tooth decay on a nation-wide basis. This proposal is to increase the fluoride content of those waters lacking in this. This subject was discussed by K. S. Quisenberry, Agricultural Research Service, U. S. Department of Agriculture, in The Scientific Monthly and was abstracted in the Navy Medical News Letter as follows:

The following five questions are answered in the article: (1) Is a beneficial nontoxic procedure to increase the fluoride content of public water supplies feasible? (2) What are the fluorides and where are they found? (3) Is the ingestion of fluorides beneficial? (4) Is the prolonged ingestion of fluorides at low levels toxic? (5) Can fluorides be used safely and effectively in any other way?

From the data presented in discussion of the preceding five questions, it was concluded that (1) bodies routinely metabolize small amounts of inorganic fluoride that are present in all foods; (2) the ingestion of an optimum amount of inorganic fluorides during tooth development results in a 50 percent lower incidence of tooth decay through adolescent and adult life; (3) the consumption of this amount of fluorides does not result in any toxic manifestations even after long periods; (4) the fluorides can be as accurately introduced in water-works as by nature; and (5) there is presently no method of supplying fluoride that is as safe and effective as fluoridation.

It is doubtful that any other public health procedure has been tested with as many patients under as many different controlled circumstances for as long periods. Nature has provided dozens of communities from the north to the south of this country with every conceivable level of water-borne fluorides, from the most minute traces to 8 ppm or more. Thus there has been available for study a wealth of epidemiologic material that could not possibly have been collected in a humanly planned survey. The data from these communities all points toward the rational use of fluorides at a level of about 1 ppm as the only known way to reduce tooth decay in urban populations.

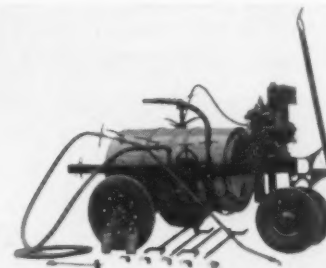
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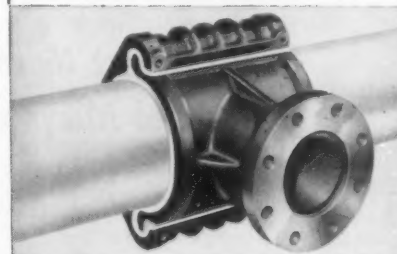
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Opponents of fluoridation frequently talk about the toxic manifestations that occur at very high levels of fluoride ingestion as if they likewise occur when water contains only the recommended amount. No scientist would disagree with the statement that fluorides are poisonous at very high levels of ingestion. What is not pointed out by the opponents is the now well-established fact that there are no toxic manifestations at the recommended levels of fluoride ingestion. Like so many substances that are essential to well-being, the fluorides have a broad

spectrum of physiologic influences, ranging from deficiency signs at suboptimal levels of consumption to a definitely beneficial phase at optimal levels, thence to a toxic phase at a much higher rate of intake. It is of the greatest importance to recognize the difference between these three stages and, particularly, the difference between the second and the third. Where the safety factor between the toxic and the beneficial levels is as large as for fluorides, no reason exists for withholding the benefits of the active agent from the public.



● TENNANT Sweeper cleans 48" path; replaces 3 to 12-man crew.

New Compact Machine Sweeps Gutters Walks and Alleys at 1/5 Usual Cost

BY SWEEPING congested areas with a new type power sweeper instead of pushbrooms, Akron, Cleveland and several other cities may save up to 80% this year in labor costs.

The new sweeper, shown at the APWA meeting in New Orleans last fall, is a compact heavy-duty machine. It cleans a 48" path and turns easily in a 5-ft. radius.

Its sweeping capacity is reported to equal that of a 3 to 12-man pushbroom crew.

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The sweeper has a powerful brush-and-vacuum system which eliminates need for water spraying or "wetting down." A rotating curb-brush sweeps leaves, dust and litter into main path of the machine.

A 36" brush, in a vacuumized compartment, throws dirt forward into an enclosed 9 cu. ft. hopper. Sweeping speed, with 2-speed transmission, is 1½ to 8 MPH.

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The new sweeper has proved most successful in "mechanizing" whitewashing work in special congested areas where big sweepers can't be used—such as gutters in downtown areas, walks, alleys, garages, driveways, etc.

In such areas a single machine is said to pay for itself in 1 to 6 months.

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The only foreseeable tangible danger with respect to the fluoridation of public water supplies involves the possibility that its dramatic benefits may lessen the willingness of the public to support dental research or decrease the zeal of independent investigators to continue their research concerning tooth decay. Even when all urban areas with water systems have incorporated optimum amounts of fluorides sufficiently long to attain full effectiveness, tooth decay will not be fully prevented among city-dwellers. In addition, the inhabitants of rural areas, which comprise approximately 45 percent of the population, will still be untouched. There can be no longer any doubt that the fluoridation of public water supplies represents the first major step in the prevention of tooth decay, yet it is not an end or complete answer in itself. The search must be increased for other ways to combat tooth decay and other dental diseases. None of these potential methods are likely to replace fluoridation, but rather they may be expected to supplement its action or increase its effectiveness.

City-County Planning

A joint city-county planning board has been established by Charlotte and Mecklenburg County, N. C., with authority to consider proposed annexations and to approve all subdivisions within the jurisdiction of the city. The city will bear 60 percent of the expenses and the county 40 percent.

Conditioning a Portland Cement Concrete Pavement For Hot Mix Resurfacing

F. W. KIMBLE,

Ohio Department of Highways
(Abstract of a paper before the Highway Research Board)

DURING 1942-43 the Ohio Department of Highways constructed a new portland cement concrete pavement on US 42 between Ashland and West Salem. This pavement was built parallel to the existing pavement, forming the north bound lanes of a divided lane pavement. This pavement was built with reinforcing and load transfer devices. This new portland cement concrete pavement was 24 feet wide with a 9-7-7-9 section, transverse joints spaced at 60 feet, alternate joints being expansion and contraction. The pavement was laid on earth subgrade.

By 1950, this pavement was in serious distress. There were many cracked, faulted and pumping slabs. The plain concrete transitions at either end were badly broken. In order to salvage this pavement, a contract was let for a hot mix resurfacing consisting of a 1¾-inch minimum leveling course and 1¼-inch surface course. The mix design for both courses was the same, using a ¾-inch maximum size coarse aggregate.

The plan did not provide any correction or preparation of the old pavement. Before work started on resurfacing, it was decided, in order to establish the benefit of pavement preparation before resurfacing, that this would be a test project. An accurate condition survey was made of the existing pavement. The pavement was prepared for resurfacing under an extra work contract. The preparation consisted of removing the badly broken areas of the pavement, excavating the wet subgrade and replacing with a granular sub-base material, installing drains and then placing plain portland cement concrete patches. Minimum size patch placed was 4 feet by 4 feet. For comparison, a few patches were placed of dry bound macadam and some of a plant mixed bituminized macadam.

Since the completion of the resurfacing, annual condition surveys of the pavement have been made. These surveys show the resurfaced pavement to be in good condition.

It is believed that the performance of the pavement to date demonstrates the importance of conditioning old portland cement concrete pavements before resurfacing. The resurfacing is now 4½ years old, almost two-thirds the life of the original pavement. With a moderate amount of maintenance, it appears that this resurfacing will have a service life of at least 4½ years more. By the end of that time economic worth of such conditioning can be determined with a degree of accuracy.

Equipment Purchase and Maintenance Costs

During 1953, Toledo, O., purchased 102 new units of motor equipment, with the street division having the largest share. Cost of new street equipment was in excess of \$139,000. Also, \$351,732 was spent for street division operation and repair, including purchase of 316,418 gals. of gasoline and 18,719 qts. of motor oil. Water division equipment cost \$28,852.

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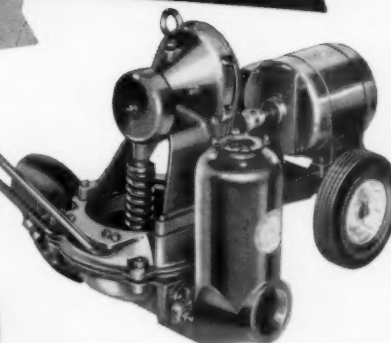
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Twenty Years of Highway Department Radio Experience

(In the Washington Highway Department News)

FROM an experimental beginning in 1934, radio-telephone communication in the Washington State Highway Department has grown until there are now 39 permanent fixed stations, 26 temporary portable stations and 200 mobile units serving the Department and the public. Our Department was the first in the nation to use radio to direct snow removal and highway maintenance.

Under the rules of the Federal Communications Commission we are authorized to use radio to transmit communications directly relating to public safety and the protection of life or property, and communications essential to official activities directly relating to the maintenance, supervision and operation of public highways.

Supervised by Radio Engineer Ellis Taylor under the direction of Maintenance Engineer John Stackhouse, our radio operation employs 7 full time and 34 part time Radio Telephone operators and 7 Radio

Telephone technicians, all of whom are licensed by the Federal Communications Commission. Mobile unit operators are not licensed but are subject to the control of licensed operators.

Radio waves are somewhat similar to light waves in their mode of travel, and it is therefore necessary that transmitters and receivers be located on high ground in order to achieve maximum range and coverage. A great deal of work has been done during these twenty years to obtain the best coverage possible.

In many respects radio provides better coverage than telephone. In outlying districts telephones are few and far between, night service on manually operated telephones sometimes leaves much to be desired, the service becomes overtaxed in the case of local disasters, strikes occasionally curtail service, and storms may bring telephone lines down.

Our most important use of radio is to direct and expedite snow removal operations, especially in the

mountain passes. A number of lives have been saved only because rescue crews were radio dispatched. When motorists are caught between slides—an ever-present hazard in the mountains—radio performs a public service by relaying messages to anxious relatives. A better known service is our daily road condition and weather report, on which thousands of motorists rely when planning winter trips. Needless to say, radio speeds the opening of slide-blocked roads because available equipment can be quickly mobilized.

Money Saved — Considerable money is saved in the Department each year by ordering parts by radio when equipment breaks down in the field. An idle crew represents a substantial loss to the state, a loss which is minimized—in some cases up to 80 percent—when replacement parts are quickly dispatched. When bridges are endangered by undercutting of piers or by debris lodged against the structure in time of rapid river rise, radio often provides the most rapid way of reporting the danger—and how much does a bridge cost?

Other Advantages — Of less importance—except in so far as frayed tempers are concerned—is the use of radio to dispatch signal technicians to repair signal devices which failed and thereby caused traffic jams. The Planning Division uses radio to check radar speed meters and odometers, and to expedite special traffic studies.

Routine maintenance operations are much more efficient than they were twenty years ago, thanks in part to radio. A superintendent cannot be physically everywhere at once, but with radio he can approach this desired goal and at the same time have more freedom of movement.

From the viewpoint of traffic safety, radio warns people away from danger areas, enables hazards to be more promptly removed, quickly summons medical assistance, and aids local authorities in coping with disasters such as flood, fire and earthquake. Many a drunken driver has been pulled from the road because our crews radioed ahead to alert the nearest State Patrolman.

From a modest beginning twenty years ago, radio is now an integral part of our operations. It is a smooth running unit of the Department, needing only technical improvements in reception and coverage to bring it to the point where little further remains to be desired.

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Studies of Waste Water Reclamation and Utilization

THE results of a survey of California practices in disposing of waste waters indicated that there are about 106 locations where irrigation is practiced; 112 where there is recharge of the underground aquifer; and one location at which industry makes use of waste waters in an industrial process. This figure does not include the hundreds of cooling towers used in industry that can be considered as devices for reusing water that would otherwise be wasted. About 700,000 acre-feet per annum of waste waters are discharged to saline waters and about 350,000 acre-feet are made available for reuse; thus there are approximately one million acre-feet of water per annum potentially available for reuse. This quantity is about 10 percent of the amount of water artificially distributed in California and one-half of 1 percent of the total water that falls on the State.

These data are from Publication No. 9 of the California State Water Pollution Control Board, which reports studies made on waste water reclamation and usage. This article consists of the summary, conclusions and recommendations resulting from that study.

Mineral analyses of ground water in proximity to recharge locations indicate no appreciable change in water quality. Field samples taken during spreading revealed that the soil was saturated to less than 50 percent of the pore space with water. It is concluded that gas must occupy the remaining pore space.

Coliform MPN's

The most probable number of coliform bacteria (MPN) were measured at a number of sewage disposal plants, some spreading primary effluent and some spreading secondary effluent. The determinations were made on samples taken from the surfaces of plants and from a depth of 2½ feet. A summary of the results indicates that:

Plant surfaces have up to 2,000 MPN/cm² with primary effluent and 0 to 10 MPN/cm² with secondary effluent; surface soil has up to 300,000 MPN/cm² with primary effluent and less than 5,000 MPN/cm² with secondary effluent; soil from 2½ feet has up to 20,000 MPN/cm² with primary effluent and about 100 MPN/cm² with secondary effluent.

The biochemical oxygen demand

of soil decreased from 100-150 ppm at surface to 20-60 ppm at the 2½-foot depth. A gradual decrease in biochemical oxygen demand with depth was evident in all five locations where such determinations were made. There is only a small change in mineral content of the water that percolated to depths of seven feet with percolation rates between 0.5 and 15 feet/day.

Mineral Increments

The tabulation of mineral increments, which resulted from a study of water use in 15 California communities, indicated increases of 100 to 300 ppm for total dissolved solids; 0.1 to 0.4 ppm boron; 7 to 15 ppm potassium; 20 to 50 ppm chlorides; and 5 to 15 percent in sodium. Values of this nature can be used to predict the probable mineral composition of domestic waste water and aid in the control of industrial wastes. When the quality of the water source is known, the increase of minerals in the water during normal

usage can aid in determining whether or not waste water will meet water quality standards for reuse water.

During field studies, observation revealed that potential health and nuisance hazards exist in certain sewage treatment facilities and practices. Mosquitoes occasionally are present and they may present a problem that requires control. Odor nuisances are apparent in heavily overloaded, poorly operated facilities. There is no apparent reason why a well-designed and well-operated water reclamation plant could not perform successfully in a nuisance-free manner.

Evaporation and transpiration losses during percolation increase the mineral concentration of the water. Spreading of waste waters for recharge, where no crops are grown, will result in less increase in mineral concentration of ground waters than when crop irrigation is practiced, if the percolation rates and other factors in each case are the same. The quantity of mineral removed from percolated water by plant growth is significant from the standpoint of change in water quality.

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Observed initial field percolation rates appear to be related to the measured laboratory disturbed-soil permeability tests. Initial work shows wide variations in permeabilities between surface, 1/2-foot and 2 1/2-foot levels. Such measurements may prove valuable in predicting percolation rates for a reclamation site before it is selected and put into use. The extreme variability in permeance between different spots in the same field and the wide variation in permeability with depth should be kept in mind, however. An understanding of the complete

soil profile is necessary along with the knowledge of the degree of podzolization and degree of dispersion of surface soils.

Conclusions

Certain general conclusions appear to be justifiable, based on observations for a period of 12 months:

1. Though sewage that potentially could be reused constitutes about one-half of 1 percent of the total annual rainfall in the State of California, there are areas where the reuse of water may be locally very important. Normal domestic sewage

can be considered a water resource that can be utilized after treatment in any place where water supply studies are made. The technical processes of treatment are known.

2. In some parts of the United States, waste water reclamation is satisfactorily practiced for irrigation of crops, for recharge of aquifers, or for industrial use.

3. The distance contamination and pollution will travel in water passing through soils or porous media appears to be a function of the percolation rate.

4. Initial percolation rates for spreading operations range from 0.5 foot to 200 feet per day at various locations. Disturbed soil permeability measurements made in the laboratory on samples taken from various depths in the soil may be an aid in predicting percolation rates in a proposed spreading ground. After a few weeks of continuous aerobic operation, the percolation rate for sewage waste waters drops to a small fraction of the initial rate. From the work completed to date one point appears to be clear: a better knowledge of the internal mechanisms involved in percolation is needed. Long term percolation studies under which a steady state condition is reached may be desirable.

5. Percolation rates are a function of hydraulic head, viscosity of the liquid, and permeability of the soil layers. The latter is influenced by such factors as soil texture, structure, and aggregation; cultivation; the soil profile; biologic growths that develop; colloidal activity and ion exchange within the soil; ratio of water to air in the soil pores; quality of the water percolated; and possibly many other factors.

6. In spreading operations involving domestic sewage, evaporation and transpiration losses alone can account for changes in mineral concentration of the percolated water, with the exception of ammonia, nitrites, and phosphates, which are probably changed by biological activity in the soil.

7. Effluents from sewage plants that provide only primary treatment when spread on crop land appear to produce high initial coliform bacteria counts in surface soil and on the foliage that has been wet with the effluent.

8. The pressure plate apparatus can be satisfactorily used to extract moisture from subsurface soil samples to evaluate the mineral quality of the percolating water

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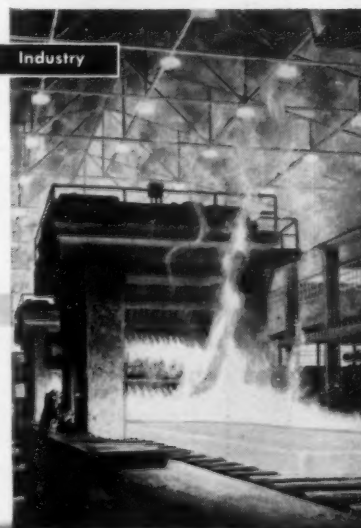
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before it reaches and is affected by the water table.

Recommendations

1. Waste water should be considered a water resource. In many areas, new plans for community water supplies should include an appraisal of waste-water utilization. Acceptance of treatment plants by the community may be enhanced when they are designated and operated for reclamation purposes. This approach would influence city layout, collection-system design, and final disposal methods. The eco-

nommic alternatives between methods of sewage disposal should, then, take into account the value of the waste water resource not only to the city but to the entire region. At present, many communities are obliged to think of waste water only as an expensive disposal problem.

To implement this recommendation, economic and technical studies are necessary.

2. A continuing study of percolation of moisture through soils and other porous media should be carried on. The necessity for understanding percolation phenomena lies

in the need for protection of underground water from pollution and contamination. Where sewage is discharged to streams, the efficiency of the treatment plant process is based on the relationship between plant influent and plant effluent; the required degree of treatment being established by determining the ability of the stream to handle the pollution load and still meet the prescribed water quality standard. Where sewage is discharged on soil for percolation, it is not at present possible to determine the exact capacity of the soil to handle the pollution load and to know what effect it will have on the underground water quality. There would be considerable advantage in considering the soil as a part of the treatment process, i.e., evaluate the sewage plant performance from the relationship between influent quality and quality of the water just before it enters the ground water table. Standard of quality for this water would be determined on the basis of the ground water use and its dilution potential. The design of the treatment system, which includes the soil as a part of the process, will require this better understanding of subsurface phenomena.

3. Evaluation of waste disposal methods on basis of the effluent quality below the ground surface before it reaches the water table is suggested as a procedure so that soil may be used to the maximum extent in the treatment process. Eventually it should be possible to acquire enough information to be able to predict, in general terms, the quality of the subsurface water when the pertinent facts about the soil and soil profile are known. In making this suggestion, it is realized that the local water pollution control boards will not be able to adopt such a procedure soon. Methods of sampling and criteria for evaluation must be further developed.

4. Attempts should be made to find technical and economically feasible methods of removing salts (particularly sodium and boron) from sewage and industrial waste waters.

• • •

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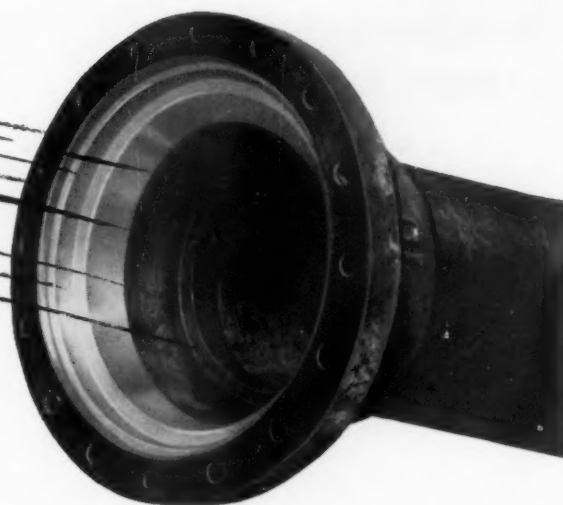
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THE Navy Bureau of Yards and Docks has participated with the Army Corps of Engineers in an extensive investigation of the behavior of asphaltic concrete surfacing when subjected to high-pressure aircraft tires. The results of these investigations showed clearly that mixtures producing a minimum Marshall stability of 1,500 lbs. are necessary to prevent displacement in the form of rutting or shoving. The results also show that at least 3 to 5 percent of air voids should be left in the pavement surfacing after the final rolling, in order to prevent "flushing up" of asphaltic cement under future traffic compaction.

In meeting these two requirements, the resulting pavement is of low asphalt content in comparison to typical state highway or city asphalt paving mixtures. Asphalt surfacings of this quality have the following characteristics: (1) They are sufficiently resistant to rutting and shoving. (2) They show no evidence of "flushing up" after

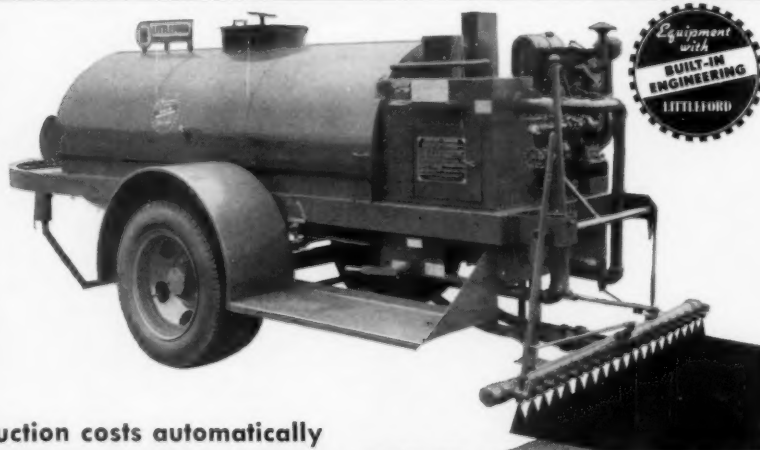
heavy traffic. (3) Runways surfaced with these mixes are, of necessity, more porous than those surfaced with richer and "closer" asphalt mixtures that contain fewer air voids. (4) On runways, concentration of aircraft traffic is usually confined to the middle 60 feet of the pavement. From the quarter points to the pavement edge, there is practically no traffic. It is a well-known and proven fact that lack of traffic will cause rapid oxidation and deterioration of bituminous surfaces. There are several measures for correcting this condition without appreciably reducing the stability or increasing the voids: (1) light drag seal coat included in the paving project specifications; (2) periodic artificial traffic by multiple-wheel pneumatic rollers drawn by light four-wheel rubber-tired tractors (should be used only in warm or hot weather); (3) increasing the thickness of a high stability, high-void "binder" course and, at the same time, decreasing the thickness, increasing the asphalt content, and decreasing the air voids of the wearing course; and (4) placement of a high-stability, high-void pavement in the middle six lanes of the runway, where the

traffic is concentrated, and a richer and less-porous mix in the remainder of the runway pavement.

The writer's preference is a light drag-seal coat of approximately 0.15 gal. of RC-2 or RC-3 cutback asphalt and 12 to 15 lbs. of coarse sand per square yard as cover material. If the seal is applied as part of the paving contract, and in dry, warm weather, the cutback asphalt will immediately penetrate $\frac{1}{4}$ to $\frac{1}{2}$ inch into the wearing course, guaranteeing a perfect bond. A slight softening effect will be noticed for the first 5 to 7 days after application of the seal coat. However, the naphtha in the material will evaporate very rapidly leaving the surface of the pavement "alive" and well sealed.

Seal coating as part of the construction contract can be placed at an approximate cost of 8 to 12 cents per square yard. On the other hand, seal coating after a short period of years would tend to be considerably higher.

This is a condensation, from Highway Research Abstracts, of an article by R. K. Compton in the Budocks Technical Digest, a publication of the Navy Bureau of Yards & Docks.



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Treating Industrial Wastes With Sewage

A paper prepared by a consulting engineer, an engineer of a state dept. of health and the technical director of an industrial firm stated that, while many industrial wastes can be handled to advantage with municipal sewage, many others can not so be treated without adversely affecting the treatment plant. The paper listed 30 process wastes, the general characteristics of each, and the unit of a sewage treatment plant that would be adversely affected by it. Of these, brine was given as the only one that did not so effect at least one unit of a plant. Most of them adversely affect biological processes, although many may be amenable to such processes.

"Effect of Industrial Wastes on Sewage Treatment Processes". *Wastes Engineering*, January.

Treating Chemical Wastes at a Monsanto Plant

The problem at the Monsanto plant at Ruabon, England, was to dispose of more than 2 mgd of wastes from a factory producing a variety of synthetic organic chemicals. As the flow of sewage in the local sewers was less than 10 percent of the volume of these wastes, it was not permissible to treat them in the sewage plant; and the effluent was to be discharged into a clean salmon stream. The solution adopted was a biochemical method based on that used successfully by the Dow Chemical Co. in the United States, essentially similar to that used in sewage treatment but with important differences. The wastes were sterile, many of them bacteriostatic, and specific organisms for their breakdown had to be developed in the system. Percolating filters were operating satisfactorily but they were investigating alternative processes, including activated sludge.

"Treatment of Chemical Wastes". *The Surveyor*, Jan. 1.

Cyanate Ion Determinations

The problem of determining the concentration of cyanate ion in mixtures where normally interfering substances are present is met through utilization of ion exchange and conversion of cyanate to ammonium which is in turn determined colorimetrically. Passing a mixture through a cation exchanger removes interfering cations. The effluent from the exchanger is treated with sulfuric acid to convert all cyanate present to ammonium, a reaction which is complete in 10 minutes. After the original exchanger is flushed with sodium hydroxide and rinsed, it can be used to retain the ammonium formed, with interfering anions passing off as effluent. Subsequent elutriation of the exchanger with sodium hydroxide will yield a solution in which the ammonium can be determined by means of Nessler's reagent and a colorimeter. The standard deviation of a set of ten duplicate analyses of a solution containing 170 micromoles per liter was 1.5 percent. A single analyst may perform 24 determinations per day routinely. Ammonium ion and cyanate can be readily determined in solutions containing both without resorting to a method of differences.

"Semimicromethod for Determination of Cyanate Ion in Presence of Interfering Substances." By William H. R. Shaw and John J. Bordeaux, University of Texas, *Analytical Chemistry*, January.

Size Distribution of Small Particles

The first of two papers reporting on the result of research sponsored by the American Society of Heating and Air-Conditioning Engineers, Inc. The first report describes the apparatus and basic principle of a new method of centrifuge sedimentation analysis which has been found to be of great practical value for measurement of size dis-

tribution of ducts in the 0.05 to 100 micron size range. Basically, the method combines gravity and centrifuge sedimentation to take advantage of the desirable characteristics of each. A special centrifuge tube and feeding chamber is described and details of operational principles are given. Basic centrifuge characteristics for this type of analysis are also outlined, as well as fundamental calculations and derivation of equations and outlines for practical methods of calculation of necessary tables and results.

"A Rapid General Purpose Centrifuge Sedimentation Method for Measurement of Size Distribution of Small Particles" Part I—Apparatus and Method. By K. T. Whitby, *Heating, Piping & Air Conditioning*, January, 1955.

Pretreating Oily Wastes

The engine plant of the Chrysler Corporation at Trenton, Mich. produces wastes composed mostly of cutting oils, soluble oils, washing solvents and crankcase oils. These wastes cannot, under regulations of the County Commission, be discharged into the city sewers without pretreatment. The pretreatment employed permits discharging a clear effluent with residual impurities well below the prescribed limits. The process is as follows: The wastes flow by gravity into a 10,000-gal. sump, from which they are pumped periodically to a 100,000-gal. holding tank, the pumps being actuated by a float in the sump. The effluent from this tank passes through a Colloidair system; the effluent from the holding tank is pumped into a closed retention tank, the suction of the pumps having connections for air injection and for feeding silicate of soda to which a small amount of ammonium sulfate has been added. The functions of the closed retention tank are to insure air saturation, complete flocculation and remove excess air. Pressure on this tank is maintained at

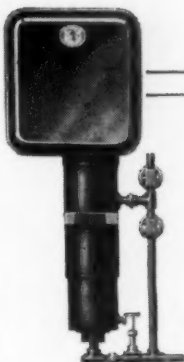
35 psig. As the wastes leave this tank, aluminum sulfate and sodium aluminate are added to bring the pH to a desired level. The liquid, with the dissolved air and flocculated oils, passes to a flotation chamber, where the floc rises to the surface and is moved to a recovery chamber, and the clear water is drawn off. Diatomaceous earth is added, and it is passed through a plate-and-frame filter; although the filtration can be by-passed if it is thought unnecessary.

"Chrysler Plant Pretreats Oily Wastes by Flotation". By Joseph Osterman, Bulkley, Dunton Processes, Inc. *Wastes Engineering*, February.

Waste Treatment for the Ruhr Valley

A factor affecting sewage and industrial wastes disposal and overall development of the water resources of the Ruhr Valley has been the shift of coal mining and with it steel and chemical industry to the north in the areas of the rivers Emscher and Lippe. Because of the poor quality of water in these rivers, water is diverted from the Ruhr to these areas for public consumption and industry. The Ruhr Reservoir Association is undertaking the construction of additional dams to cope with deficiencies in precipitation and increased drafts from the Ruhr. Twenty-five years ago the Ruhrverband (Ruhr Association) constructed a main collector from Mülheim-Oberhausen to Duisburg so that sewage and wastes from this populous area could be diverted directly to the Rhine. This is now loaded to capacity and review of the problem is necessary. Upstream from Mülheim sewage treatment plants have been built to protect the Ruhr, but these for the greater part have involved only plain sedimentation and improvements could not be undertaken in the last fifteen years. Addition of chemical and biological treatment units is now necessary. High-rate trickling filters are favored.

Industrial effluents are required to have preliminary treatment carried out by the factory. Thereafter, treatment is undertaken by the Ruhrverband. Since sewage treatment plants alone will not protect the Ruhr, precautions have been taken to hasten self-purification by construction of four artificial lakes. In recent years, pumping facilities have been installed at all reservoir sites. Thus, in an emergency, such as low water periods, water can be



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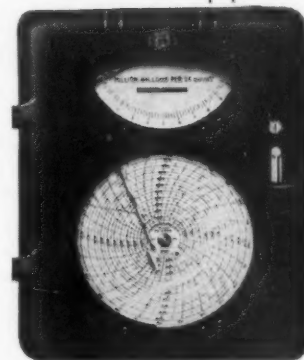
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pumped from the Rhine into the Ruhr.

"Water Supply and Sewage Disposal in the Industrial Ruhr District." By Dr. H. Rohde, Chief Engineer of the Ruhrverband, Essen, Germany.

Use of Sanitary Engineers by Industries

More and more process industries are employing young sanitary engineers as members of a team to handle waste problems; which teams develop their own manuals of practice, sometimes aided by outside consultants. Many chemical process industries have chemical engineers competent to develop such manuals. Where the waste problem involves the removal of inert suspended solids, equipment manufacturers generally furnish reliable advice as well as equipment.

"Sanitary Engineering and Industrial Wastes". *Water & Sewage Works*, January.

Symposium on Ion Exchange

Phenol Removal—Waste waters containing phenols present a serious disposal problem, particularly in the case of chlorinated phenols or strongly acid wastes. Organic ion exchange resins have been shown to sorb certain organic solutes beyond their exchange capacities for such materials. The quaternary ammonium anion exchangers have a rather high nonexchange capacity for phenolic compounds. Sorption isotherms were determined for phenol and p-nitrophenol on an anion exchange resin and found to be similar in nature to those observed in the sorption of phenols on charcoal. A number of other non-ionic phenolic compounds were found to sorb without any accompanying release of exchangeable ions from the resin. A much lower extent of sorption occurs in alcohol and allows stripping of the phenol from the resin by the use of a solvent such as methanol. This phenomenon presents a new possibility for the removal of gross amounts of phenol or phenolic compounds from waste streams and their concentration for disposal or re-use.

"Phenol Sorption on Ion Exchange Resins". By R. E. Anderson and R. D. Hansen, *Industrial and Engineering Chemistry*, January, 1955.

Chromic Acid Recovery—Chromium plating lines and other re-

lated operations discharge appreciable quantities of chromic acid to the subsequent water rinses that remove plating solution film from the treated part. The amounts of chromium discharged are frequently large enough to warrant recovery or to require treatment of the rinse waters to comply with anti-pollution laws. Chromic acid-copper stripping solutions must be treated to keep copper content low in order to maintain effective production rates, but the high cost of solution replacement often requires that the bath be kept in service after the stripping rate has decreased appreciably. Cation exchange treatment of these impure chromic acid solutions to remove metallic impurities, followed by reconcentration to the desired strength, makes recovery procedures financially attractive. Actual case histories illustrate how economic evaluation of ion exchange led to the selection of chromic acid recovery over conventional methods of waste disposal.

"Treatment of Chromic Acid Wastes; Evaluation of Methods." By R. F. Ledford and J. C. Hesler, *Industrial and Engineering Chemistry*, January, 1955.

Beta-Gamma Radioactivity Removal—A sulfonic acid-type cation exchanger can remove 75 to 80 percent of beta-gamma activity over long periods of time. The resin capacity for removing radioactivity to this extent is > 260,000 gallons per cubic foot whereas the theoretical capacity is 6,000 gallons per cubic foot for tap water containing 300 ppm total solids and 85 ppm of total hardness as calcium carbonate. The 6,000 gallons per cubic foot is the point of break-through of total hardness—i. e. leakage of calcium and magnesium ions. This means that low level wastes requiring a removal factor of no more than 80 percent can be economically processed by a convenient method. The resin can be regenerated or burned. Experiments have been conducted to determine the best operating conditions. A pH of 2.5 provides the best decontamination without filtration. A pH above 8 provides better decontamination but the waste must be filtered to remove precipitated hydroxides or the ion exchange column clogged. A flow rate as high as 10 gallons per cubic foot per minute does not reduce the decontamination obtained. Fission product analysis indicates that ruthenium and cesium are the main radioactive species present in the effluent.

"Cation Exchange Removal of Radioactivity from Wastes." By H. Gladys Swope and Elaine Anderson, Argonne National Laboratory, Lemont, Ill. *Industrial and Engineering Chemistry*, January.

Treating Pickling Liquors—The removal of iron oxide scale from steel with acid solutions prior to further processing is a necessary process. It is so widespread that the disposal of spent pickling liquors has become a difficult problem. This paper describes a cation exchange method of treating spent sulfuric acid pickling liquors. The liquors containing varying amounts of sulfuric acid and ferrous sulfate were passed downflow through a column of Nalcite HCR in the hydrogen ion form. Exhaustion of the resin column was continued until the influent and effluent concentrations were approximately equal. The effect of operating temperature, exhaustion flow rate, and regenerant dosage on capacity and effluent quality has been studied. The practical effect is the direct conversion of ferrous sulfate to sulfuric acid plus full recovery of the free sulfuric acid present in the spent liquor. The rejuvenated acid solution is returned to the pickling tanks for reuse, thus reducing make-up requirements. Regeneration of the exhausted resin can be accomplished with either sulfuric or hydrochloric acids. Several methods for handling the regenerant and the possibilities of by-product recovery are presented. The use of the ion exchange process offers a possible method for alleviation of the disposal of spent steel mill pickling liquors.

"Treatment of Spent Sulfuric Acid Pickling Liquors." By A. M. Fradkin and E. B. Tooper, *Industrial and Engineering Chemistry*, January, 1955.

Temporary Centerlining on New Highway Construction

Since it is hard to remove a painted centerline stripe from any pavement surface (a machine to do this has recently become available), some of the districts of the Washington Department of Highways use a temporary marking. This is a 3-in. by 6-in. reflectorized plastic pad which is applied with adhesive material. The pads are spaced at 8-ft. intervals. It is reported that they are readily removed with a shovel when no longer needed.



● TYPICAL sign at important intersection. Large letters make for quick reading.

Aluminum Signs for the Ohio Turnpike

ALUMINUM highway signs are being installed on the new 241-mile-long Ohio Turnpike. These signs, which number 2442, are either aluminum sheet or extruded panels and are produced by Aluminum Company of America. Of the signs, 357 are made by the Alcoa extrusion process; the remaining 2,085 signs will be made of aluminum sheet.

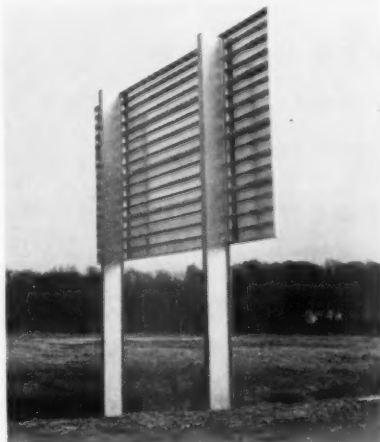
The large highway signs will vary in measurement from 4 ft. x 7 ft. up to 10 ft. x 20 ft. A majority of these large signs will be used at interchange approaches and exists and service plazas. This application of

aluminum highway signs is one of the largest of its kind in the country.

The use of extruded aluminum panels has resulted in the development of a new sign construction technique which makes it possible for highway signs of varying height and width to be built by using 2-ft. wide extruded panels that are available in lengths up to 24 feet. A sign measuring 10 ft. high by 20 ft. in length, would be constructed by using five 2-ft. wide extruded panels 20 ft. long, and mounting the panels one on top of the other until the desired height of 10 ft. is obtained. For special applications, panels 12 in. and 18 in. wide are available.

The panels are joined to the sign post by means of extruded aluminum "L" shaped clips, which are attached to the panels. A special square-head fastener, which slides in a continuous slot, fits into a hole in the post clip and permits the securing of the panel to the posts without the necessity of matching holes between the sign and the post.

Final assembly is made by securing the panels with aluminum bolts. The panels are bolted one on top of the other, at the back of the sign through their outer ribs. A finished appearance is achieved by covering the ends of the panels with an extruded aluminum snap-on-moulding. This system makes possible a smooth, flat surface in the front, unbroken by bolts or rivets.



● REAR view of a sign. Design provides for wind velocities up to 100 mph.

All types of message systems can be used on the extruded panels including paint, baked enamel, reflective sheeting and reflective buttons.

The resistance of aluminum to corrosion increases the life of the message film in that rust stains do not deface the signs when they are damaged. Repairs can wait while the sign stays on the job. These factors, coupled with fast and simple field operations when panel replacement is required, are attractive features that help keep maintenance costs at a minimum.

Various "Scotchlite" colors will

be used on the Ohio Turnpike signs. Service plaza approach, guide and regulatory signs will have a blue background with silver letters; exit and terminal approach signs and guide signs at exits will be colored green with silver lettering; warning signs will have a yellow background with black letters; and all stop signs will have a red background with silver letters.

Test reports indicate that an aluminum highway sign measuring 10 ft. x 20 ft., will withstand a wind-loading in excess of 100 miles per hour.

Comprehensive Subdivision Regulations

Comprehensive subdivision regulations have been adopted by Marple Twp., Pa., which require the subdivider to install paved streets, alleys, sidewalks, street lights, fire hydrants, water mains, street name signs, storm sewers, and sanitary sewers where connection with the sewer system is practicable. The regulations also cover conditions where either the water supply or the sanitary sewage disposal are provided by the individual on his own lot. The subdivider is required to have the state department of health make tests to determine the adequacy of the proposed facilities in relation to the lot size and existing grade and soil conditions. A lot on which both water supply and sanitary sewage disposal are individually provided must have a minimum area of 40,000 square feet and a minimum width of 125 feet. Where only one individual facility is provided on a lot, a minimum area of 12,000 square feet and a minimum width of 75 feet are required.

• • •

Emergency Generators Solve Hurricane Problems

When Hurricane Hazel knocked out the power in the Wilson, N. C., area, George Brinkley, local Equipment Superintendent for the State Highway Dept., and his men immediately put two emergency generators in operation. The generators, one permanent, the other portable, are kept ready for such emergencies.

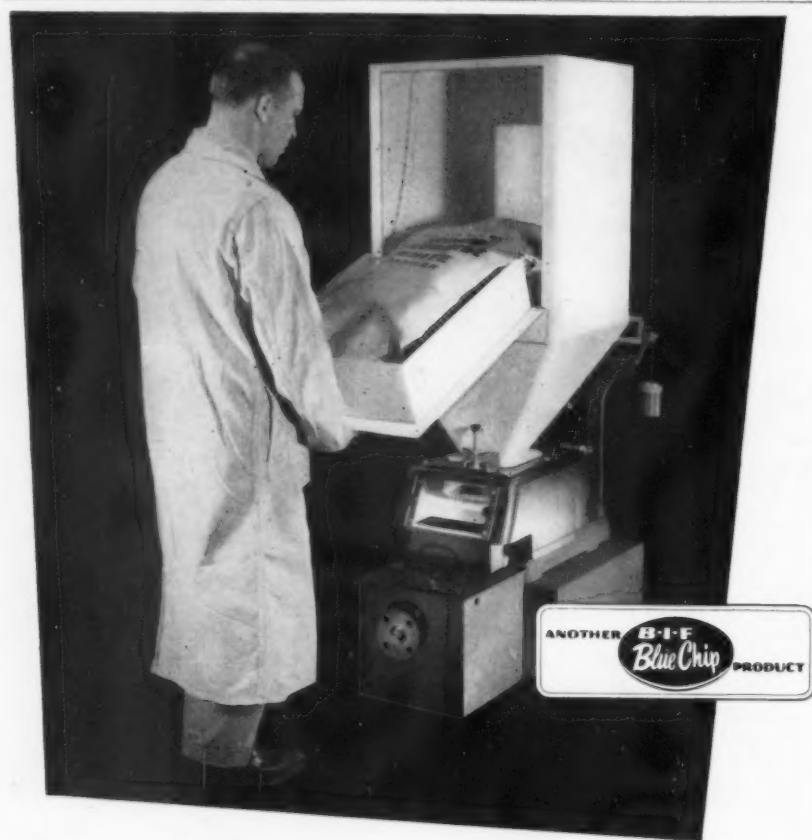
The 5,000-watt permanent unit in the division shop was switched on and furnished power for the shop, maintenance yard, road oil camp and sign department. This enabled all highway forces to operate gas pumps and other equipment in a normal manner, as well as having lights for night work.

The small, portable unit, which is usually used by mechanics on the road for drilling, was set up at the prison camp. It supplied power and lights for cooking. While the surrounding area was without electricity for several days, the emergency generators meant that highway workers could continue their work and clear the roads.

• • •

Red Highway Stop Signs in Missouri

Red "Stop" signs, with white lettering, will be replacing the present standard yellow "Stop" signs along Missouri's highways in the future.



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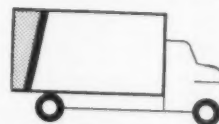
You collect more garbage per trip—cover more blocks per trip—make less trips to the dump per day with an M-B Packer Body. The reason—greater compaction!

Every yard of refuse that goes into an M-B Packer is *progressively compacted* from the first yard to the last—over and over again with each successive cycle. That's why you can compact more pounds of garbage per cubic yard of capacity with an M-B than with any other unit. Square body means no wasted corners or pockets—and high packing pressure means fewer compaction cycles.

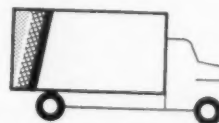
When you're selecting a collection unit—remember—it's the weight you *pack in the body* that pays off! Get all the facts on the M-B Packer Body—write or call M-B Corporation, New Holstein, Wis.

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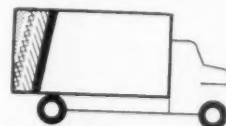
M-B PACKER gives you progressive compaction of the entire load



Loadings for the first packing cycle are compacted under a force of about 1,000 lbs. per sq. ft.



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Loadings for packing cycle 3 are then compacted, during which process, loadings from both cycle 1 and cycle 2 get another thorough compressing from the powerful M-B Plate. This is how M-B's progressive compaction assures complete compaction of the entire load.



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A Street Carries Flood Waters in St. George

One of the principal streets of St. George, Utah, has always been the natural route of flood waters on their way to the river. It had never been improved until recently, when it was graded to a disked center or "inverted crown" one foot deep and paved with a 2-in. asphalt surface on a gravel base. At the end of the street the water is carried by 170 ft. of 18 and 36-inch Armco culvert pipe.

"Flood Waters on Main Street". By Lynne Empey, City Coordinator. *American City*, January.

Garbage Cooking At Kansas City, Missouri

Of 55,000 tons of garbage a year collected in Kansas City, about 14,000 is commercial. Previous to 1953 the garbage had been fed to hogs by a contractor. Due to an outbreak of exanthema in his hogs, they were destroyed, and the garbage was ground and flushed into the river. After July, 1953, domestic garbage continued to be disposed of in this way, but the commercial garbage has been cooked and fed to hogs at the Municipal Farm, where a total of more than 5,000 animals is maintained. At the cooking plant, incoming cans of garbage are dumped into a hopper and conveyed thence by belt to a 100-hp Jacobson hammermill grinder. On the belt conveyor the garbage is sorted, metals being removed by magnet. The ground garbage is conveyed to four 15-ton cooking vats provided with mechanical agitators. Live steam enters the vats at the bottom under 10 lb. pressure and penetrates the entire cooking mass as it is agitated.

"A Garbage Cooking Plant". By Hayes A. Richardson, Dir. of Welfare. *American City*, January.

Controlling a Grease Problem

The 500,000 gpd sewage treatment plant of the International Airport

at Amon Carter Field, Fort Worth, Texas, was placed in operation April 18, 1953. It included primary settling, trickling filters and final settling. Much of the sewage is from restaurants, where garbage grinders are used, and it is very high in grease. For the first year the grease content averaged 468 ppm; it collected on the walls of the treatment tanks to a thickness of 1/4-in. to 1 in.; and a 24-in. layer of scum on the digester was 30 to 40 percent grease. The employees in the kitchens were informed of the seriousness of the problem and were able to reduce the grease content of the sewage to 225 ppm. Meantime the plant began applying Bionetic, and each two weeks add 0.75 lb. in the food waste grinder and 0.75 lb. in the digester. The scum on the digester has been reduced to about 4-in. and the walls of the tanks are now free of grease, as are also the filter stones.

"Controlling a Sewage Grease Problem". By William A. Corder, Supt. Water & Sewage Works, January.

High-Rate Leaching Of Septic Tank Effluent

Leevining, in the High Sierras of California, has a permanent population of about 200, which is increased by about 800 during the hunting season. In 1950 they began use of a septic tank 52 ft. long and 16 ft. wide. The effluent from this is disposed of by leaching in trenches 10 ft. wide and 100 to 120 ft. long, designed for 6.4 gal. per sq. ft. per day. This high rate is possible because the subsurface soil is unconsolidated sand containing many rock fragments, so clean that it is used untreated as cement aggregate; and the ground water is at great depth.

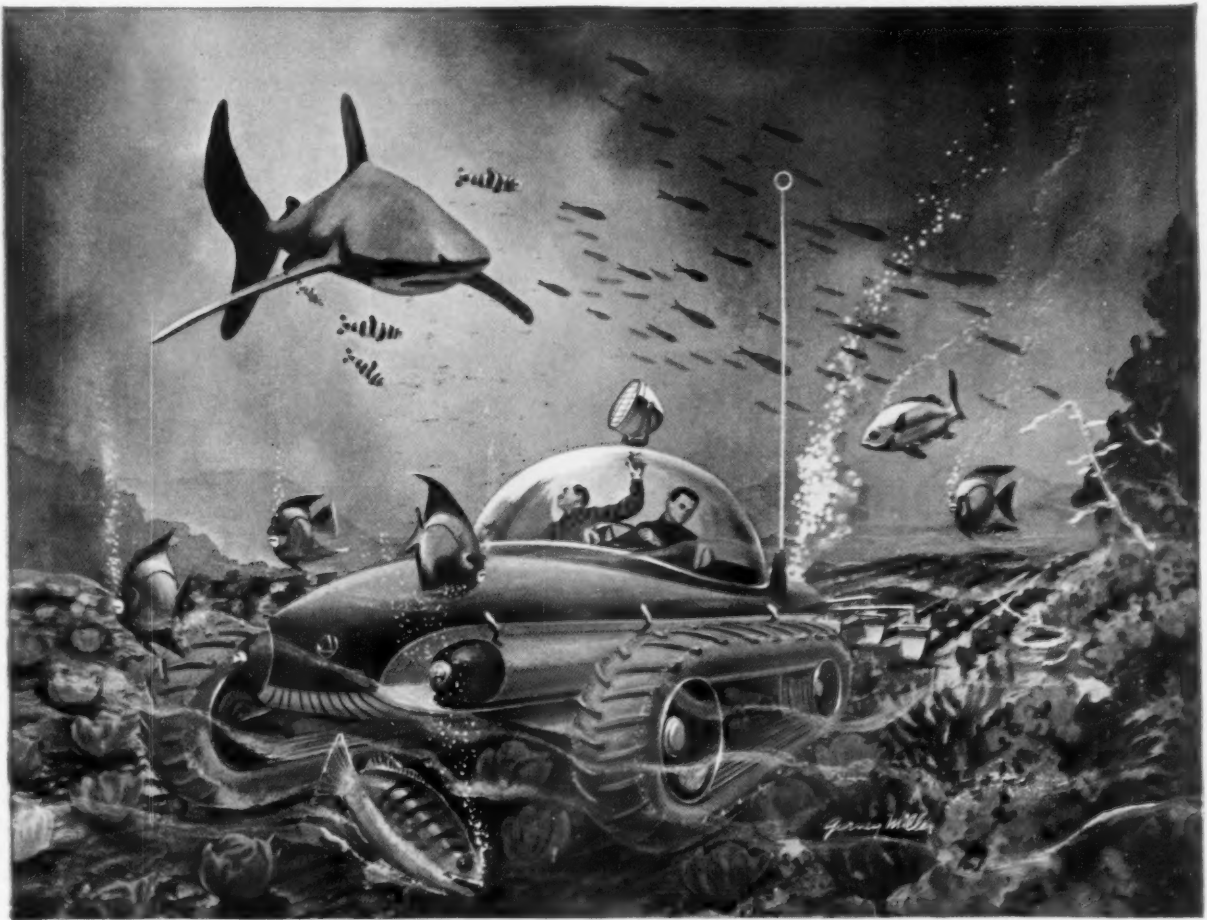
"Solving Community Sewage Dis-

Aluminum Railings for Turnpike Bridge Structures



N EARLY 40 miles of aluminum railing is being installed on the Ohio Turnpike on bridge structures, overpasses and underpasses. This is of the single rail parapet type and is mounted on aluminum castings. The reason for use lies in the re-

duced maintenance cost. Aluminum has a high resistance to corrosion and does not require painting, which may amount to 20 to 30 cents per running foot of railing. Also, it is free from rust streaks and staining of adjacent masonry surfaces.



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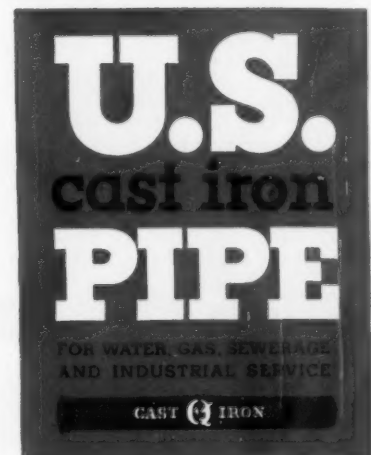
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posal by High-Rate Leaching System". By Harvey F. Ludwig, USP-HS, and Russell G. Ludwig. *Water & Sewage Works*, January.

Fertilizing Lakes With Sewage

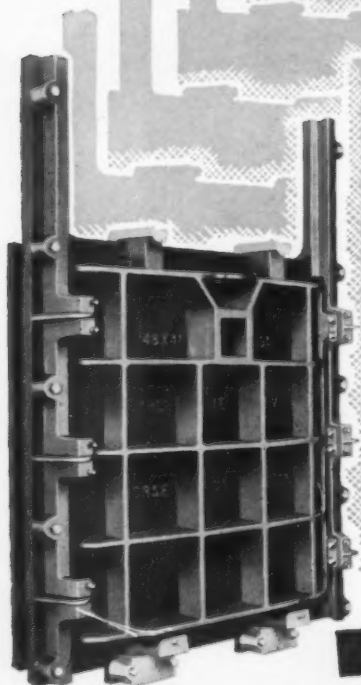
Fifteen or more minerals are found in sewage which are inorganic and only temporarily absorbed by micro-organic or plant life, being later returned to solution in the water. They are accumulative and can be removed or prevented only by discharging the sewage plant effluent into a moving body of water

or by irrigating land with it; or by removing the algae from the lake and with them the minerals they have absorbed. The first method leaves the lake more or less permanently seeded; with the second, the minerals accumulate in the soil and may contaminate the ground water. The removal of algae from the lake will remove the minerals they have absorbed, and eliminate troubles caused by decomposed algae; and it costs less than the other two methods. Algae can be removed by passing the lake water through a paper filter. To filter all the water

of a large lake would be extremely difficult, but normally surface-type algae are blown to one side of the lake, which reduces the complexity of the problem. The filters are usually set up in 500-gpm units and normally have a capacity of about 2½ acres of surface a day. The method can be simplified by running the plant effluent into a small lake or lagoon providing 30 to 60 days' detention, and filtering the effluent of this.

"Control of the Fertilizing Minerals in Sewage Treatment Plant Effluent". By R. L. Smith and Walter Subby. *Public Works*, February.

Pekrul Grows



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Profitable Salvage Of Municipal Waste

Rockville Centre, N. Y., has practiced municipal salvage for 14 years and has made a direct monetary profit grossing as high as \$40,000 a year. The past few years the gross has been only about \$10,000, which is just about the expenses of the salvage operation, including cost of modern collection equipment. Combustible material is burned in an incinerator, and the ash and incombustible material are used for reclaiming marsh land, of which 20 acres are now used as park and playground. Two laborers do the salvaging and operate the incinerator. The material salvaged includes only cardboard, rags, metals, carpets and carpet felts.

"Municipal Salvage Is Profitable For Us". By Francis J. Klaess, Supt. of Pub. Wks. *Public Works*, February.

Incinerator to Serve 12 Communities

Hamilton County, Ohio, is planning for disposal of refuse collected in the areas outside of the city of Cincinnati. The first part of the program includes the eastern portion of the county, with a population of about 47,200. At present these communities are collecting about 557 tons of waste per week, of which 390 tons are deemed combustible. An incinerator costing \$400,000 is contemplated, to be financed by revenue bonds; the revenue being obtained by charges collected from the communities for the service. The communities may raise funds for this purpose by taxes or service charges. It is estimated that incinerating 20,280 tons per year will cost \$27,014; that the annual debt service will be \$20,683.33; and a "coverage" of half the debt service

is to be provided. The service charge will probably be \$3.25 a ton.

"Incinerator to Serve 12 Communities". *Public Works*, February.

Biocatalysts In Sludge Digestion

Experiments were conducted by the authors to learn the effect of a biocatalyst on gas production, the onset of methane fermentation, and the rates at which biological equilibrium is established. In about one-half of the experimental runs, amounts of protein equivalent to those contained in the seeding mixture but without the biological preparation were fed to corresponding controls. It was learned that the rate of gas production and total volume produced were not significantly altered. The percentage reduction of volatile solids was less in the presence of biocatalyst. The beginning of the active methane-fermentation stage did not appear to be expedited. There appeared to be no increased benefits from almost 1 percent of biocatalyst during temperatures as low as 3° and 7°C.

"Biocatalysts in Sludge Digestion". By Werner N. Greene, Assoc. Prof., and Robert Q. Sload, Research Asst., Georgia Inst. of Technology. *Sewage and Industrial Wastes*, December.

Granulation of Ground Garbage

In grinding garbage for digestion with sewage, the particles produced should be small enough to permit rapid oxidation, but not so small that it will be difficult to separate them from the water. The author suggests that the present granulation codes be replaced by a uniform code based on the physical laws of grinding and the results of practical tests; also incorporating a testing procedure.

"Granulation of Ground Garbage". By Ernest Wolff. *Sewage and Industrial Wastes*, December.

Joint City-County Plant in Virginia

In 1952 the city council of Alexandria, Va., under state legislation, created a "Sanitary Authority" to build and operate a sewerage system and treatment plant. Later it entered into an agreement with Fairfax County to provide treatment facilities for the neighboring part of that county. The county will assume about 30 percent of the cost,

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its share being determined by the relative capacity of sewers, plant, etc. allotted to it, but the plant will be built and operated by the Sanitary Authority of the city. The plant will be designed to treat 18 mgd at present, with provision for enlarging it to 33 mgd about 1973. The plant will contain trickling filters, primary and secondary sludge digesters, coil-spring vacuum filters, with provision for elutriation, and chlorination of the effluent. The cost is estimated to be \$8,200,000. Alexandria will raise its share of the cost by service charges

based on water consumption, which will be collected by the privately owned water company as agent for the Authority.

"Metropolitan Area Sewage Plant Financed by Service Fees". By James J. Corbalis, Jr., Engineer-Director of the Sanitary Authority. *Wastes Engineering*, January.

Experiences With Elutriation

The Bay Park sewage treatment plant, East Rockaway, N. Y., is designed to treat 27 mgd by the activated sludge process, with vacuum

filtration of the sludge, preceded by elutriation. Experiences here indicate that solids undergoing compaction in the elutriation require adequate detention in order to obtain adequate concentration. The wash water is dependent upon the volume of sludge to be elutriated, the alkalinity to be removed, the alkalinity of the eluent and the allowable liquid detention period. A limited plant scale study led to the development of a hypothetical relationship between the quality of the elutriation tank effluent and three factors—the dry solids loading, the volatile content of the sludge, and the liquid detention time; which are combined to form the modified sludge factor. The containment-modified sludge factor relationship can be useful as an aid to the design and operation of elutriating facilities for a digested mixture of activated and primary sludges.

"Elutriation Experience at the Bay Park Sewage Treatment Plant". By Anton E. Sparr, Supt. *Sewage and Industrial Wastes*, December.

Other Articles

"Treatment of Gas Liquor on Percolating Filters". Experiments in South Africa. *The Surveyor*, Dec. 18.

"Disposal of Sewage Sludge"; 12th of a series. By Don E. Bloodgood, Prof. of San. Eng., Purdue Univ. *Water & Sewage Works*, January.

"Controlled Humus Production by Separate Sludge Digestion and Drying—The Plant and Structures"; 2nd of a series. By Leonard L. Langford, Pacific Flush Tank Co. *Water & Sewage Works*, January.

"Refuse Collection Problems in a Resort City", Miami Beach, where cleaning the streets after a hurricane requires several weeks and may cost \$250,000. By C. E. Wright. *Public Works*, February.

"Arch-Type Sewer Used With Limited Headspace" at St. Clair Shores, Mich. By Haviland F. Reves. *Public Works*, February.

"Village of 16,000 Saves \$24,000 Per Year With Sanitary Fill". Melrose Park, Ill. By E. J. Knudsen. *Public Works*, February.

"Effect of Garbage Grinding on Sewage Treatment". *Public Works*, February.

"Oxidation and Stabilization of Sewage Sludges With Oxygen at Elevated Temperatures and Pressures". Suggests replacing bacterial oxidation by chemical oxidation. By Fred Abel and R. J. Moran, Allegheny Co. San. Authority, and C. H. Ruof, Carnegie Inst. of Technology. *Sewage and Industrial Wastes*, December.

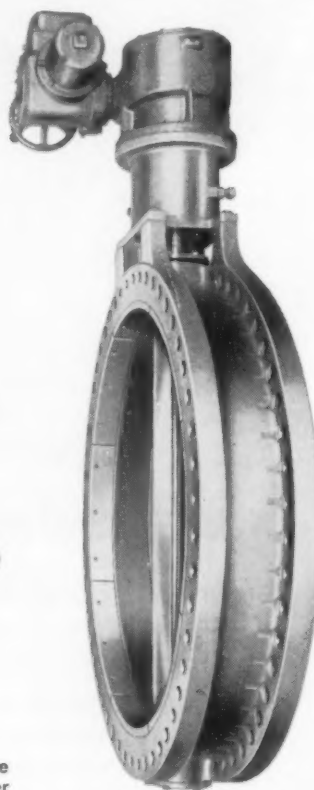
"Temperature Effects on Plain Sedimentation" in Egypt. By A. A. Abbas and M. Raef, Chemists of Cairo, Egypt.

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60" butterfly valve for a recirculating water system; fitted with rubber seat for tight shut-off, and with motor operator and auxiliary handwheel control.

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Sewage and Industrial Wastes, December.

"Getting the Best Performance From Your Sewage Works." By Le Roy W. Van Kleeck, San. Engr, Conn. State Dept. of Health. Wastes Engineering, January.

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Treatment Processes Outlined for Packing Plant Wastes

An "Industrial Waste Guide" to the meat packing industry has been prepared by the Committee on Meat Packing Plant Waste Disposal of the American Meat Institute in cooperation with the National Technical Task Committee on Industrial Wastes. This report has been issued by the Public Health Service. It covers description of meat processing; a discussion of the raw materials and product; the sources and quantity of waste; character of the wastes; pollution effects; remedial measures; and a bibliography. This article is an abstract of portions of the report.

The principal sources of waste are stockyard areas, slaughterhouses and packing houses. The stockyards produce 23,000 to 36,000 gallons of waste per acre of area, and this waste normally contains around 175 ppm of total suspended solids and 64 ppm BOD. Slaughterhouse wastes vary so greatly, due to internal practices, that no reliable data are available regarding volume and strength. Limiting figures are cited in the report indicating a volume of 435 to 1100 gals. per 1000 lbs. live weight, with BOD values ranging from 650 to 2200 ppm. From packinghouses, an average of 12 values show 1,770 gals. of waste per 1,000 lbs. live weight, with 15.0 lbs. of BOD, 12.4 lbs. of suspended solids and 1.7 lbs. of organic and ammonia nitrogen.

Plant housekeeping can reduce the quantity and strength of the wastes, but pollutional effects are such that treatment of the wastes is generally required. These wastes are amenable to biological methods, including trickling filters and activated sludge. Treatment in conjunction with domestic sewage has a number of advantages. Chemical precipitation gives an effluent relatively high in organic matter, and the cost of treatment is likely to be high; however, this method may be desirable where a less highly treated effluent is required, despite the volume of sludge that must be disposed of.

Trickling filters have been most successful for meat packing wastes. Large daily and seasonal variations in strength and volume may cause

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difficulty when the activated sludge method is used. Use of a roughing filter ahead of the aeration process may eliminate or reduce this problem. Rotary screens of fine wire mesh may remove 9 to 19 percent of suspended solids, but affect BOD very little. Sedimentation, with detention periods of 1 to 3 hours, removes substantial amounts of BOD—about 35 percent—and of suspended solids—60 to 65 percent.

Trickling Filters

Treatment in trickling filters at rates of 0.6 to 1.0 mgad gave a well

nitrified effluent and BOD reduction of 81 percent, with 88 percent overall. Double filtration has also been used. At Mason City, Ia., primary filtration at 3 mgad on a washable filter 4 ft. deep with $\frac{1}{2}$ to 1-inch media, was followed by intermediate clarification and secondary filtration at 1.5 mgad on an 8-ft. deep filter of 1 to 3-in. media. This double filtration process was followed by final sedimentation. A plant of somewhat similar design was installed at West Fargo, N. D. The primary or roughing filters are heavily loaded; the secondary filters are of

the conventional type. Overall BOD reductions of more than 95 percent are reported to have been accomplished consistently.

High rate filters, using recirculation, have also been successful. An installation at Owosso, Mich., treating about 1500 gpd of waste, consisted of filters following a septic tank. BOD removal was reported in excess of 96 percent.

Chemical Methods

Using ferric chloride, a Phoenix, Ariz., plant reduced BOD from 1448 to 188 ppm and suspended solids from 2975 to 167 ppm. It is reported that 1000 lbs. of iron and 1150 lbs. of chlorine were used per million gallons, the ferric chloride being made at the plant. Operating costs were reported at \$86 per mg, with this cost being reduced by sale of grease, sludge and effluent. Lime was used for coagulation at Madison, Wisc., but the method was abandoned because of the cost and the excessive amount of sludge resulting from the process.

• • •

Refuse Collection Data From Cleveland

Increased population, altered eating and packaging habits, and conversion of 5400 home heating units from coal to gas, reducing home burning of garbage in Cleveland, O., are reported as responsible for a steady increase in the volume of city-collected refuse, despite installation of many home incinerators. Garbage collected in 1953 totalled 235,821 tons, an increase of 11,377 tons over the preceding year. Population of Cleveland in 1953 was 914,808. Collections are made weekly, and 1000 men and 175 trucks are employed. The men work 48 hours a week and are paid \$1.44 to \$1.56; truckdrivers \$1.67.

• • •

Planning for the Future of Dallas

A study by Southern Methodist University recommends that Dallas, Tex., should confine future growth to its natural drainage area in order that municipal services can be provided economically to a compact area. The drainage area contains 260 square miles, large enough to accommodate 1,500,000 people. Since problems in the metropolitan area are complicated by the large number of cities within the county, it was recommended that the county government be strengthened and that certain area-wide functions be transferred to it.



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Supplied with the sleeve are split end-gaskets, split glands or follower rings, and longitudinal gaskets. Installation consists simply of placing the two halves of the sleeve and accessories around a broken pipe and bolting tight the joints. The longitudinal gaskets of the sleeve fit against the end gaskets, making a water-tight rubber seal. End gaskets are supplied to fit Classes AB or CD pit cast pipe, or Classes 100, 150, 200 and 250 centrifugally cast pipe. Available in sizes 4-inch to 16-inch.

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Battle Creek, Michigan	Pri. Dig.	1	2,370	2,550
Chicago, Illinois				
Calumet	Activated	3	6,667	15,850
Southwest	Activated	8	21,000	148,500
Southwest Ext.	Activated	6	21,000	49,500
Edgewater, New Jersey	Pri. Dig.	1	795	150
Fond Du Lac, Wisconsin	Pri. Dig.	1	2,350	1,300
Houston, Texas	Activated	2	12,000	30,400
Lansing, Michigan	Act. Dig. & Garbage	1	6,667	6,780
Los Angeles, California	Act. Dig.	4	22,500	79,500
Recife, Brazil	Pri. Dig.	1	943	1,280
San Diego, California				
#1 Plant	Pri. Dig.	1	3,500	7,500
#2 Plant	Pri. Dig.	1	5,000	13,200
San Francisco, California	Pri. Dig.	3	6,250	36,400
Schenectady, N. Y.	Pri. Dig.	1	3,370	2,970
Sheboygan, Wisconsin	Pri. Dig.	1	3,040	3,060
Stamford, Connecticut	Pri. Dig.	1	3,330	1,780
Washington, D. C.	Pri. Dig. now Act. Dig. later	3	12,000	65,500
Wyomissing, Pennsylvania	Pri. Dig.	1	2,218	848



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As in many other communities, a C-E Flash Drying System has converted what would otherwise be a bothersome liability into a revenue-producing asset. By drying, packaging and selling its sludge, and then deducting all fuel, power, labor and bagging costs from the revenue received, Schenectady nets approximately \$15.00 for each ton of dry solids sold. Thus far the demand for Orgro has been so great that an average week's production is sold at the plant in a matter of hours. During the winter months, when consumer demand may drop off, Orgro will be bagged, stored and kept ready for use the following spring, on the city's parks and golf courses.

Had Schenectady elected to incinerate its sludge, not alone would all revenue be eliminated, but in addition, a cost of about \$3.00 per ton would be incurred for ash disposal — a substantial item, since roughly 50% of the original dry weight of incinerated sludge remains as ash.

In communities where the character of the sludge makes it unsuitable for use as fertilizer, incineration may be the only answer. But in the many instances where these limitations do not apply, burning sludge may be equivalent to burning money.

Whether you plan to incinerate or dry, the C-E Raymond Flash Drying System allows you to do either at will. Like the communities listed at the left, you too can end your sludge disposal problems effectively and at less cost with the service-proved C-E Raymond System. For full information, contact the C-E Raymond office nearest you. A C-E specialist will be glad to help you.

B-792

PUBLIC WORKS DIGESTS

The WATER WORKS Digest



Microorganisms and Length of Filter Runs

In Chicago, in studying the periods of short filter runs, about all that has been done has been to compare the length of filter run with the number and volume of the plankton in the raw water and in the settled water. The correlation between number or volume of filter runs is none too good and points to the need of something more accurate. The author describes a new method that is being tried, which appears to have some merit. The new approach starts with a microscopical examination of the material collected at the surface of the filter bed, that is, of the material that actually clogs the filters. The most important part of the procedure is collecting the sample, the method employed being described in the article. A count is made of each species of organisms per sq. in. of sand surface, and this reduced to number per gallon of water filtered. From this is estimated the effect of each type of organism in shortening filter runs.

"Effect of Microorganisms on Lengths of Filter Runs". By John R. Baylis, Engr. of Water Purification. *Pure Water*, November.

Diffusion Wells On Long Island

The chief source of water for public supplies on Long Island is underground. Drainage of storm water in much of the island is difficult because the land is so flat. Diffusion wells, to which the runoff from surrounding areas is led and discharged underground, serve the dual purpose of drainage and conserving the water supply. The wells are made with vertical prefabricated reinforced concrete pipe with numerous flared openings in the barrel. One type of pipe is 7½ ft. in diameter and 4 ft. long; another is 10 ft. in diameter and 6 ft. long. The latter have 7-in. walls to a

depth of 60 ft., and 10-in. for greater depths. The bottom section has a steel cutting edge and the wells are sunk by the open caisson method. The rate of infiltration depends on the nature of the subsurface material; rates up to 440 gallons per sq. ft. of seepage area per day have been indicated by test. Drains discharging into the wells first pass through catch basins, where the heavy silt settles out and must be removed periodically.

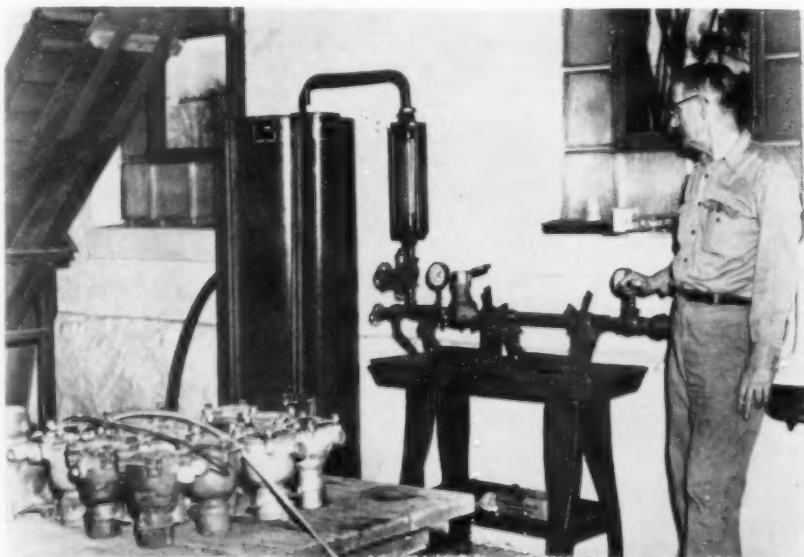
"Diffusion Wells". By W. Fred Welsch, *American City*, January.

Minimum or Service Charges

The author states the theories which form the basis for each of these methods of charging for wa-

ter; also he analyzes the methods used by 59 typical cities. In summing up, he says that the use of the minimum charge appears to be more popular than the service charge. Of the rates studied, 6 used the service-charge method, 49 used the minimum charge, and 10 used neither. When using the minimum charge, it appears wise to make the unit cost of water purchased by the minimum greater than the unit cost used elsewhere in the rate scale. To protect the value of the metered charge, it appears wise to keep the volume of water purchased by the minimum as low as remains practicable. A top limit of 3,000 gallons per month seems to be a good standard. For services requiring larger meters, both types

Meter Repair and Testing Increase Water Revenues



REGULARIZED testing and maintenance of water meters has been found to add materially to water works income. Above is shown William Wilsman, Superintendent of Water Works at Neilsville, Wisc.,

who reports that plant income was increased approximately \$5000 the first year merely by checking and repairing meters. Data from Rockwell Mfg. Co.; photo by Clark County Press.

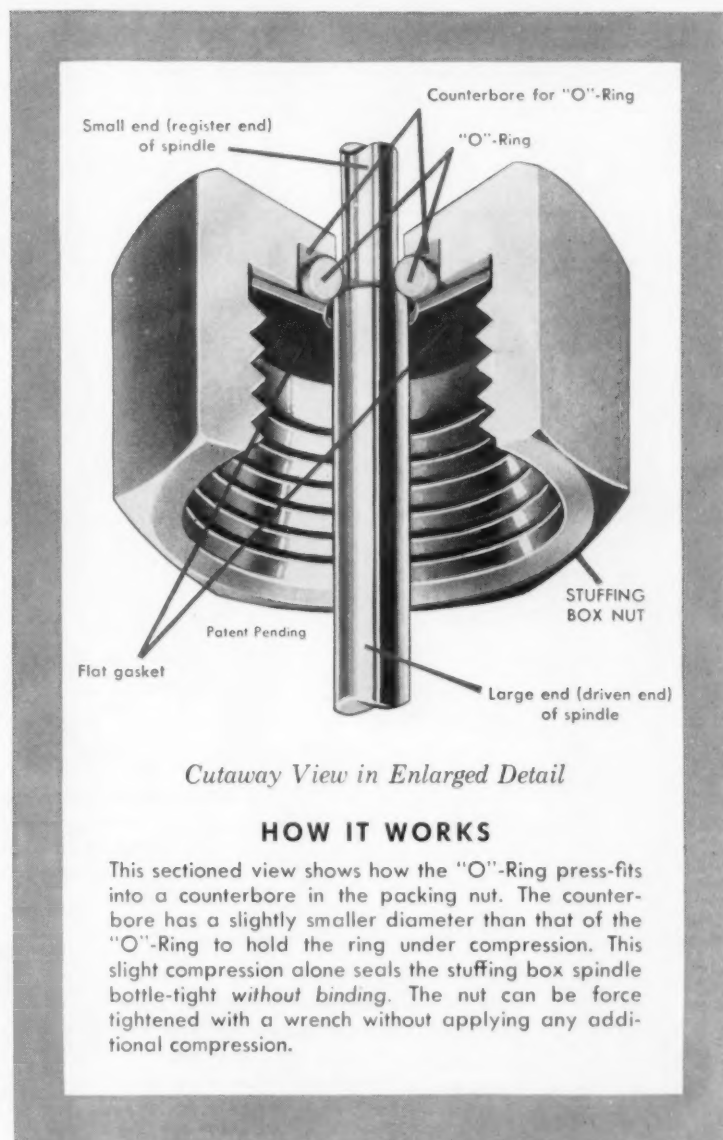
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The Rockwell "O"-Ring Stuffing Box Nut Assembly was perfected over three years ago. After extensive laboratory and field tests and without any "fan-fare" or publicity it has been used in Rockwell water meters built since that time. The superior performance of "O"-Ring construction is now a proven fact. It provides a permanent, leak tight seal at a very vulnerable point. And it actually improves meter performance by reducing friction at the stuffing box spindle. You get it only in Rockwell meters of all sizes and types. There's no extra cost, but a lot of extra value and satisfaction. Ask your Rockwell representative to demonstrate this great new advance in water meter construction.



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This sectioned view shows how the "O"-Ring press-fits into a counterbore in the packing nut. The counterbore has a slightly smaller diameter than that of the "O"-Ring to hold the ring under compression. This slight compression alone seals the stuffing box spindle bottle-tight *without binding*. The nut can be force tightened with a wrench without applying any additional compression.

The Rockwell "O"-Ring assembly is also available as an economical replacement part. It is interchangeable with the stuffing box nuts on all earlier model Rockwell meters.



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of charges justifiably can be increased because of the greater need to be ready to serve.

"Minimum Charges or Service Charges". *American City*, January.

Defluoridation

At An Army Camp

The water supply of Camp Irwin, Calif., which spreads across the Mojave Desert, is obtained from six deep wells. It has a normal fluoride content of 9 to 12 ppm, which is not seriously objectionable except as ingested by children and pregnant women. At first, water for their use

was hauled to the camp from a low-fluoride supply 37 miles away. But during the summer of 1954 a defluoridation plant went into operation which reduces the fluoride content to between 0.60 and 0.80 ppm. This water is piped through a separate distribution system to the cold water taps at the kitchen sink and lavatory of each house, and a separate tap is provided at each trailer site. The plant consists of two pressure filter units, which operate on the ion exchange principle and have a capacity of 15,000 gal. per regeneration cycle at an average flow of

20 gpm. The exchange material used is Fluo-karb activated carbon, regenerated with caustic soda and phosphoric acid. A system of automatic controls reduces the manpower required to two hours a day. The cost of the chemicals used is \$1.20 per 1,000 gal. of water treated.

"Treating a High-Fluoride Water". *Public Works*, February.

Controlling Algae And Water Weeds

Nuisance growths of algae can be limited or prevented by limiting the area of shallow water, or by limiting the amounts of incoming nutrients, nitrogen and phosphorus. The latter is being contributed increasingly by the increase in use of phosphorus-bearing detergents. Another method is exclusion of light as by covering reservoirs, or covering the water with activated carbon. Algae can be killed by adding copper sulfate to the water, several methods of doing which are described. Water weeds attached to the bottom can be removed by mowing them, for which purpose machines have been developed, as well as for removing the cuttings or floating plants. Many chemicals have been used for killing water weeds, such as 2,4-D and 2,4,5-T; but some are toxic to fish or objectionable for water supplies. Presently available algicides and aquatic herbicides leave much to be desired.

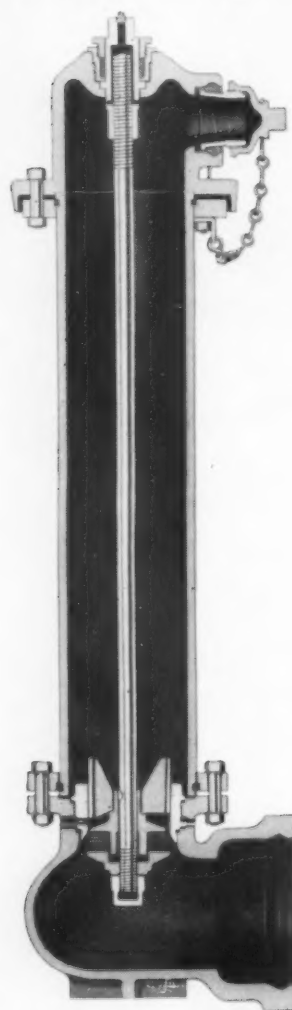
"Practical Method for Control of Algae and Water Weeds". By Dr. A. F. Bartsch, U.S.P.H.S. *Public Works*, February.

Water Maintenance In Los Angeles, Calif.

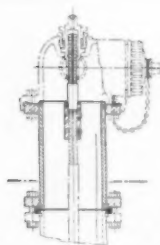
The Dept. of Water and Power of Los Angeles is a self-sustaining department, serving a population of over two million through over 5,000 miles of mains, with 30,000 fire hydrants connected. It maintains a big yard in which is a complete modern machine shop. More than 800 cars and trucks are based here. This yard rents equipment of all kinds to the other city departments at rates charged by private rental companies. A meter shop maintains, tests and repairs more than 500,000 meters.

For many years the gross and net income of the water department has exceeded its requirements, and the Board turns portions of the excess into the city's general funds, whenever and in such amounts as it thinks desirable. In 1944 the Board gained the right to operate as a

COSTS LESS TO INSTALL COSTS LITTLE TO MAINTAIN

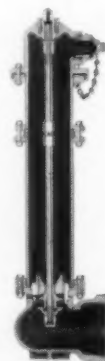


A community can rest easy when it is protected by R. D. Wood Swivel-Joint Hydrants. Trouble can be a long time coming, but when it comes these great hydrants are ready. Installation and maintenance costs are low. They work instantly, reliably. Water-carrying areas are generously sized for full flow and maximum pressure. Every point of friction is protected by at least one bronze surface. Accurately formed threads and fitted parts make them interchangeable with other hydrants of the same size. Compression-type valve stops leakage when hydrant is broken in traffic accident.



Extension piece can be inserted between hydrant head and barrel, or between barrel and elbow, without shutting off water supply.

Breakable flange and stem coupling can be furnished at extra cost. Both are constructed so that a heavy blow will snap the ring and coupling, thus saving more costly damage to the hydrant itself. Both can be replaced quickly and inexpensively with spares. No digging necessary.



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The ROLL-ON JOINT pioneered by the American Cast Iron Pipe Company and accepted as a standardized joint of the cast iron pressure pipe industry, is now available in both large and small diameter pipe. Roll-On joint pipe was introduced sixteen years ago.

Roll-On joint pipe is cast centrifugally by the Mono-Cast process in sizes 2" through 48". Standard joint materials, including rubber ring, jute and bituminous joint compound are furnished with the pipe. Roll-On joint pipe is easily and quickly assembled by unskilled labor.

This type of pipe is offered as an alternate for

standard Bell and Spigot pipe. Having a positive rubber-packed bottle-tight joint, Roll-On is lower in first cost than other types of joints. It is included in the new Federal Specification WW-P-00421 as Joint Type II.

The above illustration shows 48" AMERICAN Roll-On Joint pipe being used in the construction of a 7-mile-long water supply line in Texas. Depending upon local conditions, the contractor laid from 500 feet up to 1,000 feet per day. The final tests on the line showed the Roll-On Joints to be bottle-tight.

Users of this type of cast iron pipe are enthusiastic about it.

AMERICAN

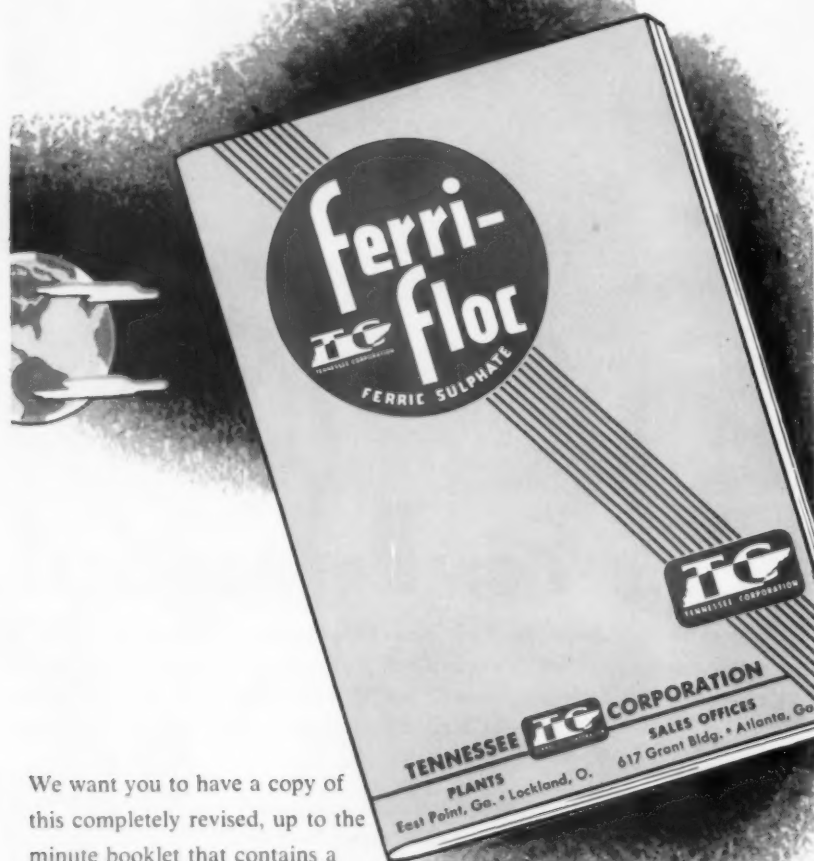
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PUBLIC WORKS for March, 1955

private utility, selling its service to the public. It issues its own revenue bonds.

"Water Maintenance in Los Angeles". *Public Works*, February.

Photographic Records at Plattsburg

Plattsburg, N. Y. has developed a system of photographic records, making glossy prints of valve locations, meter boxes and other water installations, with dimensions noted on the picture, to facilitate finding them in the future. Also pictures are taken of connections before they are filled in, to indicate to crews what to expect when they are opened later. At first $2\frac{1}{2} \times 3\frac{1}{4}$ pictures were taken with a Kodak, but details were lost in enlargements, but now a speed graphic is used with 4×5 negatives, which are enlarged to 8×10 .

Overall metering was started in 1945 and although only about half the services have been metered to date, it has resulted in saving the city approximately 1.2 mgd from a former total of 3.8 mgd.

"New Air Base at Plattsburg Boosts Water Works Needs". By Frank D. Behan, Supt. Water Works Engineering, January.

Soil Stripping Of Reservoirs

The author of a paper before the British Society for Water Treatment stated some conclusions based largely on 13 years' experience with a large reservoir in Essex, England. He believes that plankton growths are dependent to only a minor degree on direct autotrophic assimilation of inflowing nutrients, but rely largely on fertility imparted by the reservoir site, as by the decay of organic material native to the reservoir site, including aquatic weeds; which in turn were due to the original fertility of the site. Thus, the effect of not stripping a reservoir site of organic surface material before filling it may cause growth of algal flora for years afterward.

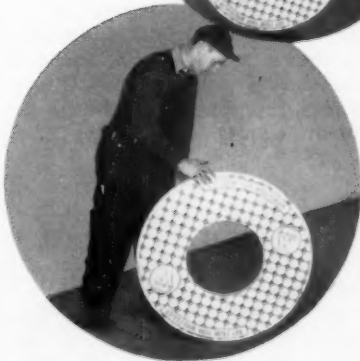
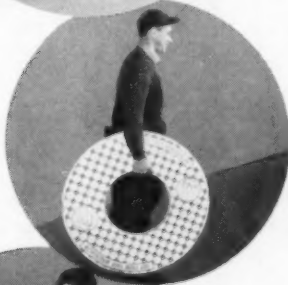
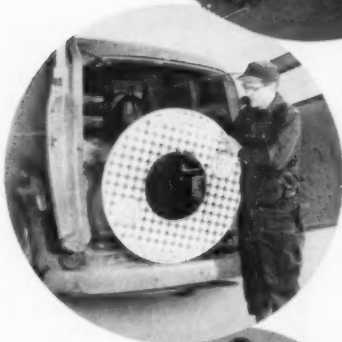
"Biological and Chemical Problems in a Shallow Reservoir". By G. U. Houghton, Chemist and Bacteriologist, South Essex W. W. Co. *Water and Sewage Works*, January.

Other Articles

"Planning a Small Town Water Supply" for 1700 people. By H. H. Mace. *Public Works*, February.

"Horizontal Wells Solve Lake County Water Problems". Sixteen Illinois communities, forming a water district, ob-

a roll of tube with *"Reel"* advantages



It's true! Wolverine's new carton was expressly designed to bring "reel", down-to-earth advantages to tubing users.

Plumbers, contractors, heating and ventilating men, refrigeration service men—all are discovering that this new carton has been designed to save them time and labor, to bring them extra convenience on the job.

Take a plumber for example. Because this new carton is round—and rolls—he can tie into a meter and roll the tube back along the trench without removing it from the carton. He uses Wolverine's new round carton as a reel.

Other service and installation men are also singing its praises. They like such features as its simplified gummed tape opening and the fact that the carton need not be mutilated to get at the tube. And they like the convenient arm hole for easy carrying, the reversed type that identifies the carton contents from any angle, the fact that the tube can be pulled out as needed and used right to the very end.

There's still the most important feature of all. That's the carton contents. There's been no change there. Into every coil of Wolverine copper water tube, refrigeration tube and automotive tube goes all the care, the quality control, the Tubemanship that has put Wolverine products right at the top. Here's tubing that is consistently good—always clean, always dry, always easy to bend.

Your wholesaler has this convenient new Wolverine coil and carton in stock.

Insist on it! And remember always **BUY FROM YOUR WHOLESALE. WOLVERINE TUBE**, 1427 Central Avenue, Detroit, 9, Michigan.



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tain their supply through a Ranney-type collector. Public Works, February.

"Planned Watershed Management Improves Small City Supply". By W. W. Ward, Asst. Prof. of Forestry, Penn. State Univ. Water Works Engineering, January.

"Religious Group Aids Villagers Build Unique Greek Pipe Line," for village destroyed by earthquake. By John H. Austin, Water Works Engineering, January.

"Water Supply Progress in 1954." By Dale L. Maffitt, Gen'l W. W. Mgr., Des Moines, Ia. Water and Sewage Works, January.

"Notes on Water Works Law". By John H. Murdock, Jr., Counsel, Amer.

W. W. Service Co. Water and Sewage Works, January.

"How Pipe Line Cleaning Saves Money". By George H. Ellis, Flexible Pipe Cleaning Co. Water and Sewage Works, January.

"The Distribution System — Elements"; 18th of a series. By George E. Symons. Water and Sewage Works, January.

"How to Make a Simple Loss-of-Head Gage". By H. K. Gidley, State Dept. of Health, W. Va. Water and Sewage Works, January.

"Elementary Chemistry for Water Works Operators". Ninth installment. By Martin E. Flentje. Water Works Engineering, January.



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Super-DeLavaud centrifugal Cast Iron Pipe and complete line of fittings. Wire or telephone McWANE CAST IRON PIPE COMPANY, Birmingham, Alabama (4"—12" sizes) or PACIFIC STATES CAST IRON PIPE COMPANY, Provo, Utah (4"—24" sizes).

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Diatomite Filters

In Illinois Swimming Pools

Filter-aid or diatomaceous earth type filter units have been installed and are in operation at a number of swimming pools in Illinois—at both indoor and outdoor installations.

The maximum rate of filtration through such filters should not exceed three gallons per minute per square foot of element surface area, although diatomite units are capable of producing a clear effluent even when the rate is higher than this maximum recommended value. High rates, however, usually result in an appreciable reduction in the length of filter cycle. At indoor pools, under average conditions of pool usage, it should be possible, and it is not unusual to obtain filter cycles of 2 to 5 days. At outdoor pools, filter runs of 24 hours duration are considered a reasonable length of cycle.

To maintain clear pool water, filters should be operated 24 hours per day, especially at pools with good bathing loads. If filter cycles are very short, obviously this recommended routine of operation on a continuous basis is not practicable because of the need for attention to backwashing the filter units 3 or 4 times in a 24-hour period. Under these conditions, difficulty in maintenance of pool water of consistently satisfactory sanitary quality can be expected. It is important, therefore, that filter-aid filter installations be of such size that they can be depended upon to provide filter cycles of reasonably satisfactory duration (about 24 hours under normal pool usage) with the rate-of-flow at the end of each cycle not appreciably less than the rate for which the recirculation system was designed.

Satisfactory filter cycle duration will normally be effected: (a) if sufficient filter element surface area is made available so that the rate-of-flow through the filter is 3 gallons or less per square foot per minute; and (b) if equipment is available for the continuous and uniform application of filter-aid slurry (body coat) to the filter influent during the course of the filter run.

It is important that slurry feeding equipment be of a type that can be depended upon to provide the uniform rate of feed desired. If satisfactory application is difficult or impossible, steps should be taken to make necessary changes or adjustments or to replace the feeding equipment.

Toward the end of each cycle of operation, the rate-of-flow through

the filter-aid is retarded due to the accumulation of dirt and organic matter on the elements. Backwashing and recharging with new filter-aid material are necessary before the flow drops to such an extent that it is considerably less than the design rate-of-flow. Operators must frequently refer to the rate-of-flow meter to keep informed on flow status. When an operator neglects, or purposely postpones, backwashing the filter units at the time when this should be done the cycle is prolonged, but instead of obtaining the proper pool volume turnover rate of six hours, he is operating at a turnover of perhaps 8 to 10 hours for probably 15 to 25 percent of the operating day. The pool water, under such conditions of operation, is not getting satisfactory treatment in accordance with the minimum requirements.

In summary, diatomaceous earth type filter installations should have adequate element surface area; should include dependable slurry feeding equipment; and should be operated with careful attention to back pressure development and the rate-of-flow through the system.—Illinois Department of Health.

• • •

Phoenix Improves Its Street Lighting

Realizing the high correlation between street lighting and crime and traffic hazards, Phoenix, Ariz., in 1951 began a four-year, \$1,300,000 program to improve street lighting. This program was approximately 84 percent completed as of July 1, 1954. During this period 1120 modern lights were installed on 15.8 miles of arterial streets, and 1318 intersection and mid-block lights were installed in residential areas. The City now has 24 miles of lighted arterial streets, compared with 5.5 miles on July 1, 1951.

• • •

City Jobs Offer Fair Pay

JOHN E. HUBEL

A study has been made by the Citizens' Governmental Research Bureau of Milwaukee to ascertain the fairness of pay for municipal employees in that city. The report shows that the average city employee gets fringe benefits amounting to about 25 percent of his regular salary, the fringe benefits covering contributions by the city, pay for time not worked, etc. This com-

pares with 19 percent of fringe benefits in private industry in Milwaukee, so that the city employee is the gainer by 6 percent in fringe benefits.

City employees are now entitled to 13 holidays a year, while those employed on salary in private industry in Milwaukee usually get only six paid holidays per year. In annual vacations city employees get 6 percent of their annual pay, while private industry usually pays its employees only 3 percent for vacations. Present retirement benefits for city employees amount to 10

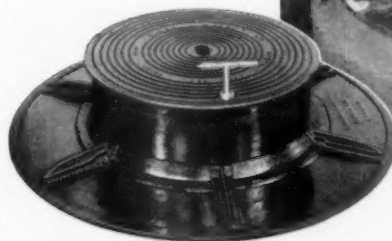
percent as against 6 percent in private industry. For sick leave the city pays 2.7 percent of annual salary, while private industry pays only 1 percent. However, the latter pays more to employees in worker's compensation and unemployment pay, and some have a profit sharing plan which the city does not have.

The report of the Bureau shows that city workers do not make a financial sacrifice by working for a municipality. None of the information in the report includes any top bracket employees, such as department heads.

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MOVES 10,000 YARDS OF DIRT PER MILE

North of Woodbine, Iowa, a file of CAT* Diesel Motor Graders is carving out another new road. This one will have a 66-foot right-of-way with 24 feet of road top—a fine addition to Harrison County's road system.

Getting it into shape quickly and economically are a Caterpillar Diesel No. 112 Motor Grader and three No. 12s—one of them with a Domar Elevating Grader. As one No. 12 flattens the ditch bottom, a second casts dirt from the ditch to the road with the Domar, and the third No. 12 teams up with the No. 112 to level the material on the roadway. They move about 10,000 yards of dirt each mile this way, and they do it for nine or ten hours a day, off only on Sundays. "We think these Cats are the finest in their field," says County Engineer T. E. Martin. "We like them and we get good results from them."

You can expect good results from them, too—especially from the *new, improved* No. 12 and No. 112 Motor Graders.

The No. 12 is now 115 HP and has faster reverse speeds. And both models now have in-cab starting, a friction-type hand throttle, and foot-operated accelerator-decelerator to vary speed.

More than 99% of all Caterpillar Motor Graders ever built are still in use. Let your Caterpillar Dealer show you, with a demonstration, all the quality features that make such a performance record possible. And while you're calling him, remember he's always handy, too, with constant service and genuine factory parts—parts you can trust.

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City _____ State _____

traffic signs have contributed greatly to keeping down the accident rate.

"Lighting and Traffic Markings Help Reduce Accidents". By Phil Hirsch. *Public Works*, February.

Bituminous Concrete Highways in Maine

Since 1950 Maine's Highway Commission has constructed 45 miles of secondary highways paved with bituminous concrete. Previously, practically all pavement on this class of highway was either of the surface treatment or mixed-in-place type. Bituminous concrete paving on their primary highways that have been in use for 15 years are still in good condition without costly maintenance; and even ten years without surface maintenance would seem to justify the additional cost of this type. Gravel is used as aggregate, subject to the Los Angeles abrasion test with 40 percent wear for 500 revolutions, on a pit-run gravel base 18 to 24 in. thick. Contracts for heavy fills and much of the base course are let for fall construction, so these benefit by fall and spring rains and winter freezing and thawing to aid settlement. Bituminous concrete pavements are planned only for highways where the ADT is 800 cars on some sections, or is expected to be soon.

"Bituminous Concrete for Secondary Highways." By Harold E. Bessey, State H'way Com'n. *Public Works*, February.

Continuous Reinforcement In Concrete Pavements

In 1938 there was constructed near Stilesville, Ind., a reinforced concrete pavement containing a number of sections, the reinforcing in which differed in types of steel and amount of reinforcement, to learn to what extent reinforcement could be used to reduce the number of transverse joints. After 15½ years of service an examination has been made and reported upon by the Bureau of Public Roads. The report states that with the proper use of longitudinal reinforcement, any spacing of transverse joints within the range studied will give satisfactory performance, without failure of the steel or adverse effects on the concrete.

In the long, heavily reinforced sections numerous closely spaced transverse cracks have developed, but these have not opened and are not detrimental to surface smooth-

ness or pavement life. In fact, an outstanding impression of the pavement is the superficial nature and structurally harmless character of transverse cracks held closed by continuous longitudinal reinforcement. Irrespective of section length, all cracks held closed by reinforcement have been highly resistant to pumping, free of faulting, and have required little or no maintenance.

Longitudinal reinforcement in very large amounts can be used without danger of cracking of the concrete above the steel, buckling failures, or disintegration of the concrete. Longitudinal reinforcement in small amount, 0.11 percent or less, should be used with caution in pavements subjected to heavy truck traffic.

The performance of the longest sections indicates that continuously reinforced pavements will be less susceptible to pumping than pavements of other designs, although under certain conditions of traffic and subgrade they will not be immune from pumping along the longitudinal free edge.

Other pavements constructed since this one are expected to yield further information which will make it possible to evaluate the relative economics of continuously reinforced pavements and those of more usual designs.

"Continuous Reinforcement in Concrete Pavement—After 15½ Years," By Harry D. Cashell, Research Eng'r, B.P.R., and Wilmer E. Teske, Research Eng'r., Indiana State H'way Dept. *Public Roads*, February.

Ability of Industry to Handle The \$100-Billion Road Program

This article contains the substance of the ARBA report on the industry's ability to handle the proposed road building program. The appraisal was made by four task forces, covering engineering, materials, contractors, and equipment, respectively. As to ability to supply the needed materials, these were considered item by item and no difficulty seemed probable. As to contractors, it seemed certain that, if highway agencies cooperated in eliminating delays and making contracts attractive, there would be no difficulty. As to equipment, the committee concluded that the industry, as now, is providing or can provide sufficient capacity to meet the high-level needs of the proposed program and also the normal needs

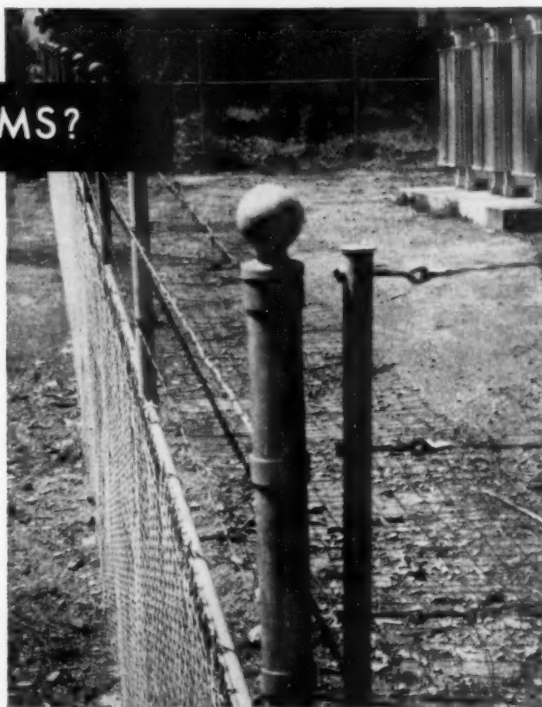
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of other users of such equipment.

"Can Industry Handle A \$100-Billion Road Program?" *Roads and Streets*, January

Photographing An Entire County from the Air

The entire 864 sq. mi. of Kent County, Mich. was photographed from the air last spring, 1824 9x9 photographs being taken, each covering an area of $1\frac{1}{2} \times 1\frac{1}{2}$ miles. The county had been mapped from the air in the summer of 1938, but land and building developments since then, and improvements in

methods of aerial photography, and photography when the leaves were off the trees made a new survey desirable.

These maps are used as aids in approving plans for suburban developments. Use of 9 x 9 prints makes it possible to plot drainage courses and determine drainage areas and compute size of drainage structures. Also house numbers that fit into the county-wide house numbering system can be assigned for any building. Many errors on old maps, such as lake boundaries and streams, have been discovered.

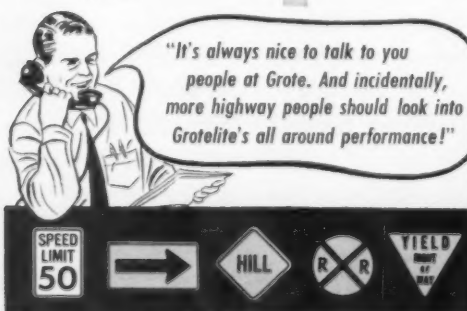
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"Aerial Photographs Taken of Entire County". By Martin Drutier, Asst. Engr., County Road Comm. *Better Roads*, January.

Private Use of Under-Sidewalk Space

Reports from 26 municipalities from Maine to Mississippi to Colorado as to whether they permit use of space under sidewalks and alleys by private owners of adjacent property, and under what conditions, show that only nine of them permit use of space under alleys, and then generally for pedestrian tunnels only. All but three permit use of space under sidewalks. Nine of these charge for such use, most of them on yearly rental per sq. ft., per cu. ft. or per lin. ft., ranging from $\frac{3}{4}$ ¢ per cu. ft. to \$1.25 per sq. ft.

"Reports on Use of Space Under Alleys and Sidewalks". By Kenneth K. King, Pub. Wks. Director, Phoenix, Ariz. *Public Works*, February.

Cracking in Bituminous Resurfaces

A test of methods for controlling reflection cracking in bituminous resurfacings, over concrete, showed that the use of wire mesh to reinforce the resurfacing over a joint offers the most promise. The mesh should be more than 4 ft. wide to prevent transfer of the crack to the edge of the mesh. This was superior to filling the crack in the old pavement with any material tried, or covering it with building paper or metal sheets. Rubber-asphalt mix cracked less than standard asphalt.

"Controlling Cracking in Bituminous Surfaces Over Concrete." *Public Works*, February.

Other Articles

"Salt Makes a Good Street" at Raleigh, N. C. By Warren J. Mann, Dir. of Pub. Wks. *American City*, January.

"The Viscosity of Tar in Surface Dressing". By J. R. Dewhurst. *Contractors Record (England)*, Jan. 5.

"1955 Roadbuilding Up 25%". Expected construction, by states. *Roads and Streets*, January.

"Winter Maintenance Work in Illinois Rolling Prairies". By R. R. Bartelsmeter, Chf. H'way Engr. *Better Roads*, January.

"Role of Maintenance Men in Emergencies". By E. A. Collier, Maint. Engr., Oregon H'way Dept. *Better Roads*, January.

"Adjusting Manholes in Street Resurfacing Programs". Use of manhole adapters. By W. M. Spann. *Public Works*, February.

"Soil-Cement Streets in San Diego" to total nearly 200 miles. Public Works, February.

"Reducing Ditching and Shoulder Costs on County Blacktop". Public Works, February.

"Turnpike Grading in the Wet" on Maine Turnpike. Roads and Streets, January.

"Financing of Grade Separations" to obviate legal delays. By James Gallagher, Bridge Engr., Div. of Highways, California. California Highways and Public Works, November-December.

"Radio Control of Traffic Signals Forecast" in a discussion by the (British) Institution of Highway Engineers. The Surveyor, Dec. 11.

"Recent Developments in the Production and Uses of Road Tar. By G. H. Fudge. Roads and Road Construction (England), December.

• • •

Roadside Planting Regulations Adopted by North Carolina

REGULATIONS and standards for roadside planting have been adopted by the North Carolina State Highway Commission. These regulations apply to individuals or civic groups who wish to plant along roadsides of the State's highways.

1. Application for a planting permit must be made in writing to the main office of the Commission or to the office of a division engineer.

2. The Commission is not responsible to the permittee for damage to the plants or shrubs by third parties.

3. The permittee is responsible for the moving or removal of the plants at his own expense when the plants interfere with highway reconstruction, safety or utility.

4. The Commission is not responsible for maintenance of plantings made under these permits unless a clear and definite agreement is reached before planting.

5. If an individual or group wants to plant on private property, not its own, which is adjacent to highway right of way, a written planting easement must be obtained from the property owner and submitted with the application for a planting permit.

6. When individuals and groups provide funds to the Commission for purchase of plants, payment shall be made by check or money order payable to the State Highway and Public Works Commission.

Standards for Planting

The following standards apply to Highway Commission employees as well as individuals or groups who deal with roadside planting.

1. Trees or shrubs over three feet



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tall shall be placed not less than 20 feet from the edge of the pavement. Exceptions: mountainous sections where plants will not add to existing topographic hazards; intersections and bridge approaches which are protected by curb; and service roads carrying light or low-speed traffic.

2. High shrubs, low-growing trees, or trees with low, dense foliage which restrict sight distance may not be placed within 1,000 feet of a highway or railroad grade separation.

3. Plants shall not be placed on the inside of curves or at other locations which might reduce existing sight distance.

4. Plants shall not be placed in median areas which are less than 40 feet in width. Exceptions: intersection areas and bridge approaches.

5. Plants shall not be placed at locations where the plants will be detrimental to drainage ditches or structures. No plants shall be placed close to the edges of steep cut slopes of moderate height which should be flattened before planting. No plants shall be placed where they will interfere with, or be damaged by, a planned or probable future expansion and development of the highway.

6. Trees which will grow above the minimum clearance under a utility line shall be planted not less than 15 feet from the line of poles; when possible, a distance greater than the minimum 15 feet should be used. Exception: low-growing plants may be planted in the cleared area of the utility line if the plants do not interfere with wire placement or repair.

7. Formal rows of plants shall not be used either through woodland or brushy cutover land or along highways with frequent curves, steep grades, deep cuts or high fills. Exception: evenly spaced rows of trees (no tree closer than 50 feet nor farther than 100 feet apart) may be planted in city, town or village approaches, in suburban areas, or adjacent to farm homes.

8. Along rural highways, only native species of plants shall be used. Crepe myrtle, abelia, spirea, etc., shall be confined to intersections, structures, suburban areas, and adjacent to homes, schools, churches, factories, filling stations, or other places of business and habitation. Native evergreens are not adaptable for formal row plantings since their dense ground foliage shuts off views of surrounding countryside. Plant-

ing clean-trunked deciduous trees is better than native evergreens.

Size of Plants

9. Medium-sized plants shall be used for roadside planting. The adverse soil and moisture conditions of the roadside forbid use of large plants which are costly to plant and hard to establish. Seedling plants are too difficult to protect during maintenance operations.

10. Annual or perennial flowers, bulbs, shrubs such as azaleas and roses, are not approved because they require special care and are too difficult to maintain.

11. Any exception to the above standards can be approved only by the Raleigh office of the Commission.

• • •

Georgia Had No Waterborne Diseases

No cause of disease was traced during 1954 to any of the more than four hundred public water supplies owned and operated by municipalities, counties and industries furnishing water to over one-half of the total population of Georgia. —1954 Report, W. H. Weir, Director of Water Pollution Control.

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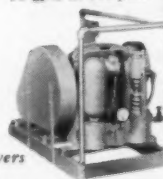
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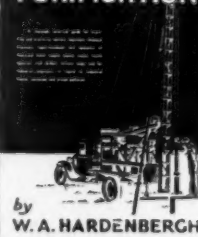
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Among the major changes introduced in this latest edition are the following: the chapters on ground water, on filtration, and on laying pipe and maintaining lines have been almost completely rewritten; the chapters on pipe conduits and on disinfection have been revised to bring the material in them up to date; and a new chapter has been added on fluoridation. Also, there are new appendices. One of these, “Planning for Emergencies and Civil Defense,” contains the available information on bacteriological and radiological warfare and protection against sabotage as these subjects pertain to water works.

Now's the time to mail this month's Readers' Service card.

Bituminous Stage Construction

EARL COYNE,
Highway Superintendent,
Aberdeen, South Dakota

A FIVE-YEAR plan was established in our county in 1951 to provide a bituminous surface-treated network of roads to connect up all of the outlying towns to Aberdeen, the county seat. The annual daily average vehicle count runs from 200 to 500 per day on the county roads under consideration. These connecting highways were designated as the county trunk system along with a few other important routes.

Construction Procedures

All of the roads were either properly graded, drained and gravel surfaced or placed on our program for construction. As the work progresses existing bridge structures having less than an H-15 load capacity are replaced. Compaction of the subgrade is obtained by watering and sheepsfoot rolling. Unstable spots are undercut and replaced with select soil during grading con-

struction whenever this is found necessary. Surfacing procedures are as follows:

Compacted Gravel Base Course: From experience and observation it was decided that not less than a 5-inch base course was necessary before applying a road oil surface. A maximum size of $\frac{3}{4}$ -inch crushed gravel surfacing material with a good gradation is specified for the flexible base. Not less than 20 percent of the fine material must pass a 40-mesh sieve. **Rough screen** analysis taken at the gravel producing plant requires 30 percent to 45 percent retained on a $\frac{1}{4}$ -inch sieve. A low PI is desirable—a plasticity index of from 2 to 6 is used with good results.

Mixing, placing, watering and pneumatic tired roller compaction is done in 2-inch lifts. In some localities it has been found desirable to use finer granular material for the first lift to conserve gravel and as an economy measure. After the material is placed one final pass is made with a steel faced tandem roller, and the surface then allowed

to cure before the bituminous penetration coat is applied.

Prime and Blotter Course: We elected to use slow curing road oils for both the prime and blotter treatments. The softer cut-back asphalts allow more time to manipulate the material with drag brooms and rollers. Also, we think that we get more bituminous material for the money.

First we broom off loose float material or dust with a power road sweeper broom. SC-1 road oil is applied at the rate of $\frac{1}{3}$ gallon per square yard and the prime allowed to lay open for 3 to 6 days. During this period normal traffic uses the road. Following this, a blotter course of SC-4 road oil is placed at the rate of $\frac{1}{3}$ gallon per square yard. Application of the blotter gravel follows directly behind the oil distributor. The same $\frac{3}{4}$ -inch gravel used in the base course is placed at the rate of 45 pounds per square yard. Then one pass each is made with a drag-broom and a 10-ton steel faced tandem roller. After this we use a pneumatic tired 13-wheel roller and continue to drag-broom and roll the surface to manipulate and blend in the surface materials. The road remains open to traffic

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using 12 ft. of the 24-ft. roadway alternately. Processing of the gravel blotter material and road oil is obtained initially through brooming and rolling along with vehicle movement on the roadway.

Two-Year Seal Course: After the surface treated route has been in service for 2 years a seal coat is applied using 1/3 gallon of bituminous material and 1/2-inch maximum size crushed gravel maintenance chips. This follow-up seal course has a leveling effect, builds up the thickness of the wearing surface, and assists further in water-proofing the base.

An open faced gravel surface generally has the ability to aerate and allow moisture collected below to pass off; but after the bituminous application weak spots occasionally develop. In some instances, these areas are detected and strengthened before construction begins. The treated road is watched closely and any break-up occurring in the base or surface is immediately corrected and repaired with processed black-top material from a stock pile.

Costs: The average cost per mile of blotter course including gravel base, prime and blotter on 53 miles completed is \$5,280. The average cost per mile of the two-year follow-up seal course on 9 miles completed is \$1,630.

This article is abstracted from a paper presented at the ARBA National Highway Conference of County Engineers and Officials, held in Columbus, Ohio.

• • •

Houses Moved Back to Widen Streets

Improvements to relieve a bottleneck on U. S. Route 15 were recently completed at St. George, S. C., where the town's main street was widened from 32 to 66 feet by an extensive project of altering buildings and reconstructing the highway.

In order to obtain additional width for the street, approximately 38 feet was cut off the front of 12 buildings. The same amount of space was then added to the rear of the structures. Other buildings were moved back from the street. Alterations to the 12 buildings were made by M. K. Kahn Construction Company of Columbia, while the moving of buildings was done by Sellers House Moving Company, Inc., of Greenville. All buildings affected were on the same side of the street.

A contract was awarded to Bal-

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Longer Paving Company of Greenville on a bid of \$176,544.99 for the widening and surfacing of the street, and construction of necessary concrete curbs, gutters and sidewalks.

The old concrete pavement was retained throughout the project, and new base material was added where necessary to raise the widening strip to a level with the old pavement. Asphaltic concrete was then applied to the entire width of the street. Although all widening in the business section of town was confined to one side, additions were made to both sides of the highway at the ends of the project where there were few buildings to interfere.

Improvements to the street in addition to the widening project include the installation of new street lights, more orderly arrangement of overhead utility lines and installation of modern traffic lights.

• • •

Rating System for Secondary Roads

A new priority system for the selection of secondary roads to be surfaced in the Second Division, North Carolina State Highway Dept., has been instituted by H. Maynard Hicks. The selection of which road to improve first is based on the actual service it renders its community.

Each unpaved road in a county is evaluated by specific standards and then placed in its order for improvement. A copy of the priority schedule for improvement is kept in the division office and in the office of the district engineers. The County Commissioners of each county receive a copy also so that they know which unpaved roads are scheduled for improvement, why, and their priority.

The system works like this: Each unpaved road in a county is numbered. Its length and daily traffic count are recorded. Then the road is rated on the following basis: ten points for each school; seven points for each active store, garage, filling station or combination; three points for each cotton gin, corn mill or small plant; three for each school bus passing in one day; three points for an RFD mail route; three points for daily pick-up milk route; three for each industrial bus passing in one day; one point for each two vehicles; and one point for each four vehicles diverted. The one point given for each family dwelling is divided by the mileage.

Every unimproved county road in the Second Division is evaluated on this basis. The road with the most points receives first priority and is scheduled first for improvement. The road evaluation system is far from perfect but to date it has worked well in informing not only the Highway Commission but also the County Commissioners as to which roads should be paved first. The priority system also has met with a favorable response from the newspapers and County Commissioners in this Division.

Dual Disposal

(Continued from page 76)

larger; but the digesters and sludge drying facilities showed be increased 30 percent.

A review of results at the Indianapolis sanitation plant during the summer and fall of 1935, when garbage was added to the sewage, shows an increase in suspended solids in settled sewage of 30 percent and of 11 percent in BOD. Results at Marion, Indiana, during the years when garbage was added directly to the sewage, show lower suspended solids and BOD in the primary effluent than was the case before garbage was added. At Findlay, Ohio, the results during garbage grinding show increases in suspended solids in the primary effluent of 16 percent and of BOD 19 percent. However, it is believed that much of this increase was from a bad supernatant liquor returned ahead of the plant from an overloaded digester. The digester was not increased in size when garbage grinding and activated sludge treatment were started. In view of these studies, it is believed that the data presented on pages 75 and 76 are conservative.

Other factors than economics should be considered in reaching a decision as to whether garbage is to be digested at the sewage treatment plant or one of the alternate methods used. Agricultural experts have often stated that our economy is based upon six inches of top soil and of this about two inches have already been washed away by wrong farming methods. Since both garbage and sewage digested solids contain large amounts of humus, plus nitrogen, phosphoric acid, potash, and some trace minerals, what better use could be made of these solids than to apply them to the land to build up our depleted soil. It seems wrong to the writer to destroy this organic matter when it is so badly needed for our soil.

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PUBLIC WORKS EQUIPMENT NEWS

Published Monthly

March, 1955

Two Front End Loaders for Fordson Major Tractors

Two hydraulic powered front end loaders with greater reach at maximum and intermediate heights have been added to the Sherman Products line of excavating, earthmoving and material handling equipment. They are designed for installation on Fordson Major tractors. Rated lift capacity of Model AJ-20 is 2000 lb., struck bucket cap. is $\frac{1}{2}$ yd.; Model AJ-25, 2500 lb. lift cap., struck bucket cap. is $\frac{3}{4}$ yd. The location of boom hinge points on both models is designed to give the loader its extra long reach. Other features include: twin double acting cylinders controlling bucket tilt; double acting lift cylinders, which provide both lift and down pressure for maximum operating efficiency; a crankshaft-mounted Hydreco gear pump powers the units. Attachments available for the AJ-20 in-



Greater reach at maximum height is a feature of this new front end loader

clude $\frac{1}{2}$ and $\frac{7}{8}$ -cu. yd. buckets, a 6-ft. bulldozer blade, and an 8-ft. boom. Buckets for the AJ-25 are available in $\frac{5}{8}$ and $\frac{7}{8}$ -cu. yd. capacities. More from Sherman Products, Inc., 3200 W. 14 Mile Road, Royal Oak, Mich., or circle No. 3-1.

Neon Walk-And-Wait Pedestrian Signals

This neon pedestrian signal is designed around a standard signal housing and may be used with existing signals or in new places by mounting on standard brackets.



Pedestrian safety signal coordinates street crossing with flow of traffic

The units are available with "DON'T WALK" or "WALK-WAIT" tubes as desired. Letters are 4 ins. high to provide maximum readability under all normal conditions. The weight of the standard unit is about 25 pounds. All you want to know about details of construction, circuits, etc., you can get by writing Southern Signals, Inc., 222 Beach St., Shreveport, La., or by circling No. 3-2 on the coupon.

Cuts Holes Through Metal, Wood or Plastic

This "universal hole cutting tool" will cut any size hole from $1\frac{1}{8}$ to $3\frac{1}{2}$ ins., in wood, metal or plastic. Depth of cut is $\frac{3}{8}$ inch in metal and 1 inch in wood which is doubled by turning the sheet or board. The scale is calibrated in pipe and conduit sizes as well as by $\frac{1}{8}$ -inches. Each set has three individual cutters—one for wood, one for metal and one for plastics. Write Robertson & Ruth, Box 534, Elmhurst, Ill., for many details omitted here, or circle No. 3-3 on the coupon.

PORTABLE RIG HELPS AIR PLACEMENT OF CONCRETE

This is a portable rig which can be used for concrete and masonry restoration, repair and maintenance; water-proofing; stuccoing; sand-blasting and many other similar jobs. It consists of a Mix Elevator which mixes the aggregate and prepares it for the Bondactor which shoots the mixture into place by means of compressed air. Models are available which will handle $\frac{3}{4}$ yd. an hour, $1\frac{1}{2}$ yds. and 3 yds. Also available is an "Airplaco Nucretor" which places $4\frac{1}{2}$ to 6

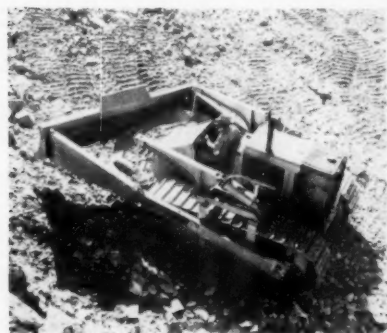


Concrete gunning unit is combined with proportioning-mixing-elevating units.

yds. an hour. For a lot of information on air placement of concrete write Air Placement Equipment Co., 1011 W. 24th St., Kansas City, Mo., or circle No. 3-4 on the coupon.

New Attachments for Eimco Crawler Tractor

Bulldozer, winch or other attachments are now available for the 105 Eimco tractor. This tractor, when announced about a year ago, was available with loading attachment. Both loader and bulldozer are Eimco products, but the basic trac-

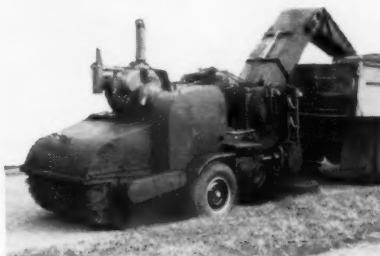


Eimco tractor with angle dozing blade

tor is built to standard SAE mounting dimensions so that any attachment made with standard SAE drilling will fit. More from Eimco Corp., Salt Lake City, Utah, or circle No. 3-5 on the coupon.

Sweeper Loads Debris into Truck

A dual purpose street sweeping machine, designed to eliminate the cost of re-handling debris, loads sweepings directly into a dump truck body at the same time that it cleans the pavement. The unit is



Debris is loaded directly into truck by the Elliott "Street Master" unit

towed behind the dump truck and can travel to the job location at traffic speed. Gutter brooms, pick-up broom, loading elevator and other working parts are independently powered by a heavy-duty air cooled engine. A 230-gal. water tank is provided to eliminate dust while sweeping. Full data on this unit, named the "Street Master," may be obtained from M. A. Elliott, 611½ Sandusky St., Ashland, Ohio, or circle No 3-7 on the coupon.

¾-Yard Model Added to Shovel Line

This ¾-yard Unit Challenger shovel is completely new in design and construction, and includes an hydraulic clutch control; full floating trunnion mounted tapered drums; self-aligning hook shoes that distribute applied pressure over a maximum bearing area; force feed lubrication; interchangeability of parts; and full vision safety cab with large side entrance. It is powered by a Ford heavy-duty industrial engine with torque converter. More from Unit Crane & Shovel Corp., 6411 W. Burnham St., Milwaukee 14, Wis., or circle No. 3-8 on the coupon.

Tractor Shovel Handles Tough Digging

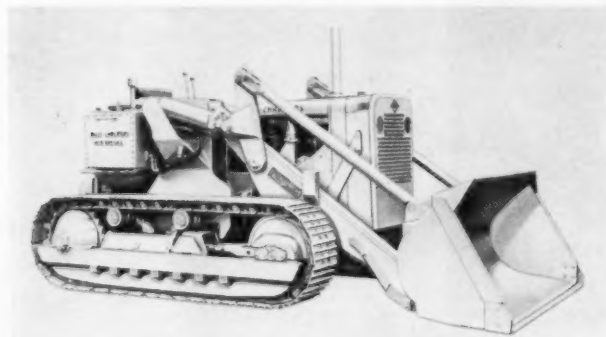
The 2-yard Model HD-9G tractor shovel has been announced by Allis-Chalmers. This new and more powerful shovel is said to offer greater productivity, longer life, maintenance simplicity, ease of operation and maximum visibility. Net engine hp is 100 and drawbar hp is 28. With a low gear speed of 1.4 mph, this unit develops 23,000 lbs. pull at the drawbar or push at the shovel. It also includes a new ceramic master clutch lining originally developed for aircraft wheel brakes, which reduces lever pull for easier operation and increased clutch life. The new bucket design facilitates digging, loading and dumping and reduces spillage. A new hydraulic system practically eliminates external hoses, fittings and hardware. New type shovel side frames are mounted on the tractor rigid beam with wedge blocks to maintain rigidity. The new stabilizer and cowl provide maximum operator vision. A

new attachment includes a Tip-Back bucket which allows the operator to roll the bucket back approximately 25° at ground level. Complete details from Allis-Chalmers Manufacturing Co., Tractor Div., Milwaukee 1, Wis., or circle No. 3-6 on the coupon.

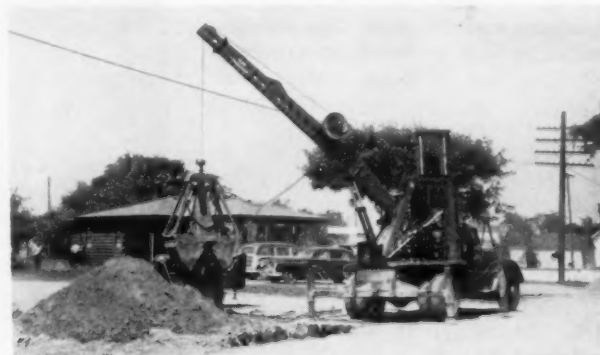
Two-Ram Clamshell Bucket for Use with Hydrocrane

A ¾-yd. clamshell bucket which uses two hydraulically operated rams instead of a single center ram to handle bowl action is now available from Bucyrus-Erie Co. This bucket is for use with the truck-mounted, all hydraulic H-3 Hydrocrane, to step up the digging output in any kind of going. Use of twin rams, coupled with improved leverage, provides 42 percent more force to the lips at the point of closing than the earlier bucket. The bucket area and internal size have been increased; the struck measure ca-

capacity is 10.4 cu. ft. Bowl sections are curved to provide maximum penetration and quick loading with minimum heeling. In addition, bowl pivot shafts have been replaced with short pins so there is nothing to obstruct loads in the bucket. A quick-disconnect coupling for the tagline hose is provided, which can be attached or detached from the bucket in a few seconds without the use of tools and without oil spillage. Further details from Bucyrus-Erie Co., South Milwaukee, Wis., or circle No. 3-9 on the coupon.



New 2-yard HD-9G Tractor Shovel made by Allis-Chalmers is more powerful; features completely new bucket design



Two hydraulically operated rams handle bowl action of the ¾-yd clamshell bucket for Bucyrus-Erie Hydrocrane

Oliver Announces New Medium Size Crawler Tractor

The OC-12 is Oliver's new crawler tractor. This is available with either a 45-hp diesel or a 44-hp gasoline engine. In addition to extra lugging power, engines have double filters, chromium-plated piston rings, belt driven generators and instant electric starters. There is plenty of space for the operator—good platform room, a wide seat of foam rubber, with arm rests. All controls are in easy reach at the middle of the instrument panel. Operator visibility is excellent. The battery is 12-volt. Two track widths are available, 44-inch and 60-inch.



Oliver OC-12 crawler tractor is powered with either diesel or gasoline

Operating weight of the tractor is about 11,000 lbs. Allied equipment includes an hydraulic loader and hydraulic bulldozer. More from Merchandising Dep't., Oliver Corp., 400 W. Madison St., Chicago 6, Ill., or circle No. 3-10 on the coupon.

3/4-Yd. Shovels, Trench Hoes, Cranes, Clamshells, Draglines

A new line of 3/4-yd. machines are now being manufactured by



Wayne Shovel and Crane Division. Described as a custom made machine, the buyer can specify exactly the crane or excavator which meets his individual requirements. Extra optionals include independent boom hoist, friction-type swing lock double-load rollers and power lowering. Other advantages include a positive crawler lock and one lever steering control in the crawler model; a 19-ft. trench hoe boom which permits a 31-ft. 2-in. reach and digging depth of 20-ft. 5-in. Models 70, 50A and 50B are available as a shovel, trench hoe, crane, clamshell and dragline. Further details from Wayne Shovel & Crane Div., American Steel Dredge Co., Inc., Fort Wayne, Ind., or circle No. 3-11 on coupon.

Chain Saw Converted into All-Purpose Clearing Unit

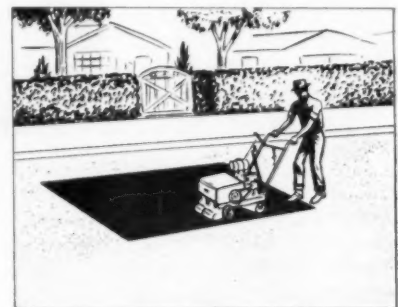
Homelite is now making a low-cost attachment for converting their Model 17 chain saw into an all-purpose clearing unit. The attachment is said to be ideal for land clearing contractors, county road crews, pipe line companies, park and forestry departments, etc. It permits one man to do the work of a whole gang of men using saws and axes. A jaw-grip spike permits plunge-bucking of logs right on the ground; the spike bites into the dirt and keeps the chain out of the dirt and prevents logs from rolling or spinning away. It also facilitates reaching out to the limb without having to go underneath; and takes the backache out of bucking and under-bucking. Complete data from



Homelite Corp., 48 Riverdale Ave., Port Chester, N. Y., or circle No. 3-12 on the coupon.

Asphalt Compactor for Patching Jobs and Close Corners

Designed especially for compacting asphalt surfaces where conventional asphalt rollers cannot be used, this compactor is most useful for patches, drives and small parking areas. It has no overhang; it tamps and rolls flush with walls. The roller is 18 ins. wide. Driven by a 3-hp engine, it delivers 350 strokes per minute, weight is 350 lbs. Its use can eliminate the need for heavy

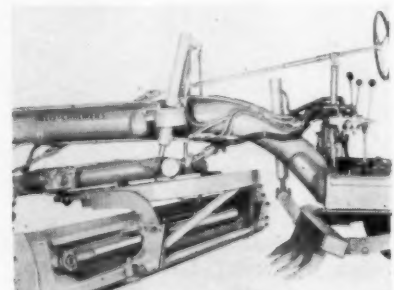


Leveling a bituminous patch with the portable Lucas asphalt compactor unit

equipment on many small jobs. More from Lucas Asphalt Compactor Co., 2209 E. Market St., Stockton, Calif., or circle No. 3-13 on the coupon.

Improvements to Allis-Chalmers Model D Motor Grader

A new front wheel assembly reduces the number of wear points on the Model D A-C motor grader and provides added strength as well as improved control over leaning operations. Also, as an additional accessory, a hydraulic shiftable moldboard has been provided which permits a side shift of 16 ins. right or left with control from the operator's seat. More about both from Tractor Division, Allis-Chalmers Mfg. Co., Milwaukee 1, Wisc., or circle No. 3-14 on the coupon.



No More Raising Manhole Covers For Street Paving

Segmental risers can be used for adjusting the height of manhole risers and covers during paving

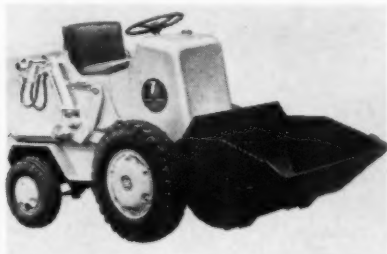


Segmental risers adjust manhole grades when resurfacing

operations, avoiding the necessity for tearing up the street around the manholes in advance of paving. The segmental risers are placed end to end to form a circle or ring which supports the cover at the desired elevation. The paving material holds the ring of risers securely in place. These risers will fit manhole covers 21 to 26 ins. in diameter; minimum rise is 2¼ ins. and heights increase in increments of a quarter inch. Ask for Bulletin 543, Huffer Foundry Co., Warsaw 2, Ind.; or circle No. 3-15 on the coupon.

New 18-Ft. Capacity Tractor Shovel

An entirely new HA model has been announced by Hough. This is the smallest tractor-shovel made by

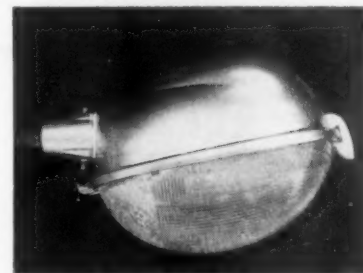


Small Payloader model has increased capacity and greater dumping height

that company. Payload capacity is 18 cu. ft., with a struck capacity of 14 cu. ft. Turning radius is shorter so that efficient operation in close quarters is insured. More from Frank G. Hough Co., Libertyville, Ill., or circle No. 3-16 on the coupon.

New G-E Luminaire Improves Mercury Vapor Lighting

General Electric's new Form 400 luminaire, which represents a major step in the technical advancement of mercury street lighting, has been designed to direct more actual light on the street, and provide improved uniformity of pavement brightness. This unit utilizes a total of five different mercury lamps, and is equipped with hinged glassware which provides simple accessibility to its interior; also, both reflector and glassware can be removed without the use of tools. It can be operated on either conventional circuits with ballasts or in series on the new G-E Ballastless Mercury circuits; and is also adaptable to various distribution patterns which permit desired street spacing ar-

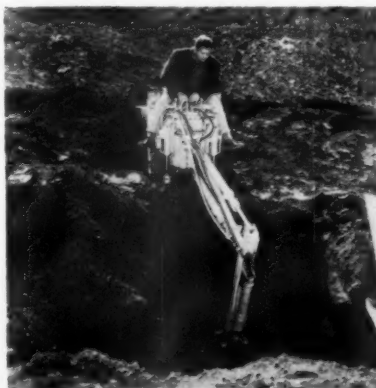


Luminaire for use with mercury vapor lamps puts more light on the street

rangements. The parts for this luminaire have been highly standardized. More information from General Electric Co., Schenectady 5, N. Y., or circle No. 3-18 on the coupon.

Hydraulic Backhoe for Agricat Tractor Digs Trenches

A new hydraulic backhoe converts the Agricat tractor into "an amazingly efficient ditch digger" according to the manufacturer. It



Agrihoe attachment for the Agricat tractor digs ditches in tight spots

is possible to dig trenches 9 or 12 ins. wide to a depth of 6 ft., and to load to a height of 8 ft. It is said to be specially suited to tight-spot and close-quarter trenching. More from Earl H. Pence Co., Inc., 2150 Washington Ave., San Leandro, Calif., or circle No. 3-17.

F & P Chlorinator Has Fibre-Glass Cabinet

A cabinet of polymer-impregnated fibre-glass has been developed for the new Fischer & Porter chlorinator. The cabinet is corrosion proof and does not require painting. The new chlorinator has a capacity of 8,000 lbs. per day maximum, 100 lbs. minimum, through six metering



Cabinet of F & P chlorinator is made of light fibre glass

tube and float combinations, interchangeable from the front of the cabinet. Many automatic functions are incorporated. Full information on these from Fischer & Porter Co., 296 Jacksonville Road, Hatboro, Pa., or circle No. 3-19 on the coupon.

Hydro-Mat for Wetting Rolls on Road Rollers

Hydro-Mat is used to provide a constant wash for road rollers, and will distribute water evenly over the entire face of the roller. These mats are constructed of the finest cocoa fibers, are engineered to use less water, retain moisture longer and maintain a brushlike stiffness. They are made in sizes to fit all makes of rollers. More from Koffler Sales Corp., 3757 No. Racine Ave., Chicago 13, Ill., or circle No. 3-20 on the coupon.

Classified Advertising and Job Opportunities

RELAY TECHNICIANS

Foreign Service

Qualified Journeyman Electrician with minimum 2 years' experience as a Relay Technician investigating and correcting power line circuit troubles caused by relay failures.

Write giving full particulars regarding personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 100

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A young married man, who will graduate in June with a B.S. in C.E., is looking for an opening in municipal engineering. He also has a B.S. in Industrial Management, and has had experience as a draftsman and an industrial process engineer. A complete personal data sheet and references will be sent upon request.

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Excellent opportunity with Philadelphia's Water Department. Vocational or high school graduation plus eight years experience in maintenance and operation of large electrical pumping stations. Four years of experience should have been in supervision. Substitutions of experience or training for above will be considered. Civil service security, health and welfare plans, paid vacations, holidays and sick leave. For further information, contact before March 28, 1955:

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POSITION WANTED

Civil Engineer, 30, Registered, with 6 years experience in responsible municipal and municipal consulting positions desires position with municipality or consultant in Wisconsin or Minnesota. Will consider areas west of the Mississippi. Pavement, sewerage, water and Administrative experience. Excellent record of dealing with the public.

Write to:

Box 3-3

Care of this Magazine

EQUIPMENT PRICED FOR QUICK SALE

P&H 655, 1½ yd. shovel front, 1946, extra bucket, 13,600 Cat diesel.
Northwest Model 6, 1½ yd. shovel front, 1950, Murphy diesel.
AC HD-14 & AC HD-10.
Worthington air compressor, 315 cubic, 1952, International diesel.
Gallon Chief 10 ton roller, 1948.
Ingersoll Rand wagon drill, 1953, heavy duty, rubber tired.
D-8 Angle Dozer, 2 U Series, 1953 model.
Le Tourneau Scraper 15-19 yd.
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P.O. Box 222

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Care of this Magazine

WANTED COUNTY ROAD COMMISSIONER

The County of Mono, State of California invites applications for this position. Applicants must be registered California Civil Engineers with experience in administration, engineering, road construction and maintenance. Salary \$550.00 per month for a 6 month probationary period. At end of probationary period, salary increases depending upon qualification.

For information, write or call:

Howard Emrich
Acting Road Commissioner
Bridgeport, California

WANTED

Man to travel Virginia and North Carolina calling on cities. Must be mechanically inclined.

Write to:

Box 3-2

Care of this Magazine

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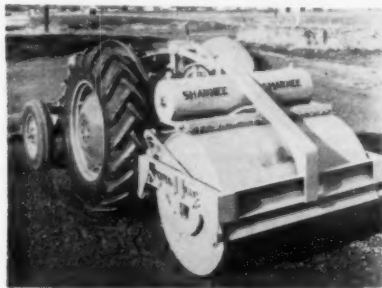
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Shawnee Announces Tractor Mounted Patch Roller

Attaching to the rear of a rubber-tired tractor, this roller can be transported quickly by raising the roll hydraulically. But by lowering the roll, the rear wheels of the tractor are raised so that the combined weight of the tractor and roller are available for compacting, producing compression of 90 lbs./sq. in., without adding fluid to the roll. Attachment to or removal from the tractor is a matter of



Rear-mounted roller on wheel tractor

minutes; and it is designed for many popular makes of tractors. More from Shawnee Mfg. Co., 1947 North Topeka Ave., Topeka, Kans., or circle No. 3-21 on the coupon.

King-Sized Earth Auger Has Many Uses

This portable, mechanical earth borer is driven by power take-off through a telescoping torque arm. It will quickly sink holes for poles



for power lines or signal supports, for posts for guard rails and do other similar jobs. Suspended by a derrick and winch line, the auger is guided by a crew man at the hole. Ask for data on the Model 4401-M from J. H. Holan Corp., 4100 West 150 St., Cleveland, O., or circle No. 3-22 on the coupon.



Safer and more efficient operation is claimed for left-hand mower mounting

Left-Hand Model Mower for Convenience

This new mower when mounted on the left side of the tractor allows it to work facing traffic, increasing the confidence and safety of the operator because he is able to see on-coming vehicles. This convenience will sometimes eliminate an idle trip when cutting is required on one side only. Both left and right mowers may be mounted on the same tractor, each ready for use as required. It is claimed that this arrangement results in more miles per day of mowing with less fatigue. More information from A. C. Anderson, Inc., P. O. Box 391, Wildwood, N. J., or circle No. 3-23 on the coupon.

Concrete Saw With 25-HP Engine for Heavy Work

Driving the cutting saw at full load at speeds up to 12 ft. per minute, this concrete saw is equipped with a 25-hp 4-cylinder engine. Among the advantages are easy handling, straight cutting, hydraulic depth control and dual mounting of blade guard and blade, permitting cutting on either side. Optional features are electric starting and



Heavy duty concrete saw is powered by a 25-hp, air cooled gasoline engine

water pump. Complete information from Eveready BrikSaw Co., 1509 So. Michigan Blvd., Chicago 5, Illinois, or circle No. 3-24 on the coupon.

Fischer & Porter Announces New Portable Chlorinator

A portable chlorinator for temporary or emergency use, just introduced by Fischer & Porter Co., weighs less than 40 lbs. and has no exterior dimension greater than 20 ins. The compact unit has its own carrying handle and can be transported readily by car, train or plane. The tough, light fibre glass cabinet and special plastic and alloy piping and controls make the unit both light and completely corrosion resistant. Only three simple piping



Emergency chlorination needs are met with portable unit

connections are needed to put the unit in service. A wide capacity range, from 1000 to 0.1 pounds per day, may be obtained through a selection of metering tubes. Further details are available from Fischer & Porter Co., Hatboro, Pa., or by checking No. 3-25 on the coupon.

Lightweight Generator for Cities and Towns

A lightweight generator that can be carried by one man is manufactured by Master Vibrator Co. This unit is run by a 4-cycle, direct-drive, 3-hp gasoline engine, and can operate small tools, floodlights, electric pumps, or any other similar electrical equipment. Almost instant operation is accomplished because of its automatic rewind starter and two built-in sockets. It is available in DC (97 lbs.) or AC (107 lbs.). Complete data from Master Vibrator Co., 262 Stanley Ave., Dayton, Ohio, or circle No. 3-26 on the coupon.

Dodson's Digest



Why Calcium Chloride is used on highways and in highways

Went ice fishing the other weekend with one of my neighbors, Pete McCracken. Pete is a road checker with a big trucking company, and knows the roads in the state like I know my own back yard.

Like my back yard, the back-road short cuts were pretty much snow covered. So he advised that we stay on the main highway on our way to Hawkins Landing at Diamond Lake.

"What do you think we'll get?" I asked Pete as I accelerated slightly to pass a slow-moving panel truck.

"About 30 days if you don't slow down," Pete quipped. "There's a speed zone ahead, and it's radar controlled. You'll see the sign in a minute . . ."

"Okay, smart guy, so you know the roads," I broke in, "or the state trooper. But I'll have you know I *always* watch for the signs! The signs are there for driver safety—our safety: 'soft shoulders, dangerous curves, side road, men at work, danger ahead, stop' . . ."

"Reminds me of a girl I knew once in Philly," Pete interrupted grinning. "Seriously though, Dod," Pete continued, "Our boys take those signs to heart, too—have to, to stay alive in the trucking business."

"We play a role in highway safety, too, with Calcium Chloride," I replied. "Road-maintenance crews spread Calcium Chloride regularly on the shoulders to keep down dust caused by passing vehicles. Helps prevent ruts when a rear tire of a tandem slips off the road onto the shoulder. Highway-upkeep costs are cut considerably."

"What's more, Calcium-Chloride-treated abrasives on icy roads melt ice, prevent accidents. Fact is, they use Calcium Chloride in the road itself. Makes concrete more workable, gives higher early strength, provides . . ."

"Dod," Pete interrupted. "About those signs you *always* watch for?"

"How's that, Pete?" I asked.

"We were *supposed* to turn—back where it said 'cross road' . . ."

—L. D. DODSON

P.S. Our brochure, "The Why of Wyandotte Calcium Chloride for Roads," is packed with ideas and technical data. For a copy, just drop me a line. Wyandotte Chemicals Corporation, Wyandotte, Michigan. Offices in principal cities.



HEADQUARTERS FOR CALCIUM CHLORIDE

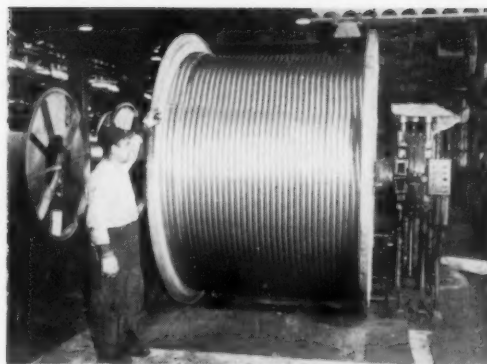
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—Worth Seeing



With the digging up of this 138-year old cast iron pipe in Montreal the Cast Iron Pipe Research Association transfers the title of oldest living pipe in active service from Philadelphia (135 years) to Montreal. Mr. Frank V. Dowd, superintending engineer of the Montreal water system, is a record-breaker, too, with 123 years service by self and family to it.



Aluminum Cable! One of six reels of ALCOA Expanded ACSR. Each reel contains 7,400 feet of the 1.75 inch cable, able to carry a 300,000 volt load. In aluminum, too, progress marches on!



The attractive young lady here displays equally attractive Minnesota Mining & Manufacturing's ready-made traffic sign faces. They come with "Scotchlite" reflective sheeting or "Scotchcal" non-reflective plastic film to renovate signs.

Punching out road between Dawson and Stewart River Crossing Road, Yukon Ter. Traffic load is already quite "heavy," averaging four or five cars every day. Gravel is placed over moss and permafrost in spots to make this road. Ultimately 120 miles long, it will replace an old tractor train trail. Speed limit and signs have not yet been set.



Ripping up Chicago's Outer Drive, on the North Side with traffic continuing to flow. This was accomplished by the Standard Paving Co. before winter set in. Here an Allis-Chalmers HD-15 and ripper were working west lanes with east lanes left open for traffic.

Pace-Setting HD-5G Tractor Shovel

**These days ...
wonderful
buildings are
made in factories**



Stores, factories, offices, warehouses—Butler buildings meet a wide range of needs. Do a better job for far less money.

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Address _____

City _____ State _____



WORTH TELLING

by Arthur K. Akers

★ **DARLING VALVE & MFG. CO.** news includes: a new sales office at 30 N. La Salle street, Chicago, under B. E. Engstrom; addition of Frank C. Zeis to handle St. Louis area sales; Lewis M. Poag, Cincinnati sales; while Leon A. Hoffmeister moves to New York (500 Fifth Ave.) to replace B. F. Marcin, promoted to larger responsibilities at Pittsburgh.

★ **EDWARD F. RAY** becomes general sales manager, Marmon-Herrington's All-Wheel Drive truck division, Indianapolis.

★ **JOHNSTON PUMP CO.**, Pasadena, sold to Emsco Mfg. Co., Los Angeles. Otherwise, no change.

★ **R. W. (Dick) PEARCE**, moves up at B-I-F Industries, Providence, from manager of chlorinizer sales to works manager.



Mr. Pearce



Mr. Winemiller

★ **WILLIAM H. WINEMILLER** succeeds Kenric H. Bird as assistant sales manager, refractories division, Norton Co., Worcester, Mass.

★ **GEORGE B. MOTHERAL** is new advertising manager, Hagan Corporation, Pittsburgh, all subsidiaries. He is a director and past president of Pittsburgh chapter, NIAA.



Mr. Motheral



Mr. Ford

★ **WORTHINGTON CORPORATION** news includes: William A. Meiter, now general sales manager, vice Thomas J. Kehane, upped to



Mr. Meiter



Mr. Bowdoin

vice president, sales. George E. Bowdoin, formerly president U. S. Hoffman Machinery Corp., joins Worthington as assistant to the president. Clarence S. Wentworth succeeds Mr. Meiter as central region sales manager in newly-located Detroit office, 13305 Puritan Ave.

★ **LE ROI DIVISION**, Westinghouse Air Brake Co., names Paul D. Sullivan assistant sales manager, Milwaukee.

★ **BEN H. JUHAN** becomes manager of gratings Division, Kerrigan Iron Works, Nashville.

★ **JOSEPH DIXON CRUCIBLE CO.**, Jersey City, promotes H. E. Ehlers, Jr., to general sales manager, R. C. Brock to industrial sales manager, D. C. McMillin to district manager, Pacific Coast.

★ **H. W. ("Hap") FORD** retires as sales manager, Pittsburgh-Des Moines Steel's eastern district, to be succeeded by his brother, C. R. Ford. "Hap" gets his mail henceforth at his lakeside home near Mt. Vernon, Maine.

★ **CIVIL SERVICE EXAMINER**, "Why do you think yourself qualified for a diplomatic post?" APPLICANT, "I've been married 20 years and my wife still thinks I have a sick friend."

—Baker Sales Builder

Pace-Setting HD-5G Tractor Shovel

NOW BETTER 3 WAYS



HD-5G TRACTOR SHOVEL

Rated capacity	1 1/4 cu yd
Belt horsepower	50
Weight, complete	16,200 lb
Dumping height	9 ft, 2 in.

From the time of its introduction seven years ago, the Allis-Chalmers HD-5G Tractor Shovel has been tops in popularity. Many thousands are daily proving their ability and versatility on all kinds of material handling and excavating jobs.

Now, design refinements make the HD-5G a three-way better value than ever before:

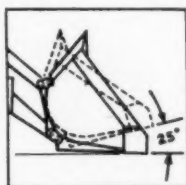
1. Has Bigger Rated Capacity

New bucket handles a big 1 1/4-yd load — streamlined design now helps roll in large loads with less tractor effort. The back of the bucket has been brought forward and the sides extended to cut spillage, put more payload where it's wanted.

2. Helps the Operator Do More

Cleaner dumping with the new bucket saves the operator time and effort shaking out loads.

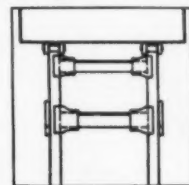
For added versatility, there is a two-position bucket available with both standard automatic return to digging position and operator-controlled tip-back. If the operator chooses to use the controlled tip-back, he can load the bucket, then tip it back approximately 25° before raising, assuring maximum output under special conditions such as downhill loading or loading loose materials.



The HD-5G helps the operator do more in other ways, too — giving him full vision, fast and easy control, cleaner platform and more comfortable seat from which to work, and more working time with truck wheels, support rollers and idlers that need greasing only once every 1,000 hours.

3. Works at Lower Cost

The HD-5G now works at even lower cost than ever before — not just because it *does more*, but because it has features that mean *less maintenance, longer life*. For instance, new type tubular bracing on the bucket booms provides added strength and support, keeps the bucket in line. The floor at the rear of the new bucket has been raised seven degrees to reduce wear on the bottom sheet. Heavy-duty truck wheels and idlers are available for particularly tough working conditions. One-piece, full-length main frame permits unit construction so that major assemblies can be removed without disturbing adjacent units, putting tractor back on the job in hours rather than days.



Ten Quick-Change Attachments Add to HD-5G Versatility

Bulldozer	Crane Hook	Tine Fork
Angledozer	Light Material Bucket	Rock Fork
Narrow Bucket	Trench Hoe	— also rear-mounted Ripper
Rock Bucket	Lift Fork	

ALLIS-CHALMERS

TRACTOR DIVISION — MILWAUKEE 1, U. S. A.



**HERE IS A PARTIAL LIST OF MATERIALS
USED IN W&T CHLORINATORS:**

"Pyrex" Glass
Platinum
Silver
Monel
Tungsten
Tantalum
"Hastelloy C"
"Kovar"
"Coblenium"
"Isolantite" and other Ceramics
Fiberglass Reinforced Plastic
"Teflon"
Hard Rubber
"Saran Rubber"
"Saran"
"Kel-F"
"Kralastic"
"Hypalon"
"Uscolite"
Unplasticized Polyvinyl Chlorides
Plasticized Vinyls
"Lucite"
"Plexiglas"

*Where glass is needed,
glass is used*

How well chlorination equipment does its job depends not only on proper design but on the selection of the right material for each part of the assembly.

In W&T equipment, every part is employed where it best suits the purpose for which it is intended. And every part gives good service because it is made of the right material for the job. Glass, metals, ceramics, and many types of plastics are used throughout Wallace & Tiernan's complete line of chlorinators — and each is selected for its ability to give you the most satisfactory operation under your plant conditions.

Since 1913, W&T research has consistently sought out new designs, principles and materials. Every new development is placed under rigid field tests to prove it can meet the exacting standards that dependable and economical chlorination demands.

When you depend on W&T equipment, you have the assurance that 40 years of experience in the chlorination field is being used to bring you the best in design, parts, and materials — selected and tested specifically to fit the need. When you are looking for chlorinators that last, ask for Wallace & Tiernan first.

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*"Make Your First Choice
Equipment That Lasts"*



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